GDPS Ver. 1.2

User's Manual

Korea Ocean Satellite Center

Korea Institute Of Ocean Science &

Technology

http://kosc.kiost.ac/
http://www.kiost.ac/

1   About GDPS

Background and Motive of Development

GDPS(GOCI Data Processing System) is a software program designed to analyze and process satellite data of Geostationary Ocean Color Imager(GOCI), which was launched in July 2010. The development project started in 2003 when the hardware of GOCI was being developed and completed in 2008 based on the algorithm researched and completed in 2007. The completed GDPS offers two different operating modes: the Server(Real-time) mode that produces ocean color data and information on a real time basis and the Interactive mode designated to all general public, including researchers and onsite end users working on GOCI. A functional upgrade of GDPS in 2008 implemented a number of additional functions, including surveying yellow dust and land (e.g. Normalized Difference Vegetation Index (NDVI)) with enhancement in real-time processing function. The Korea Ocean Satellite Center has produced regular ocean color data through the GDPS Server mode since the successful launch of GOCI in 2010 and released GDPS Ver. 1.0 for general users in September 2011.

This user's manual describes the Interactive Mode of GDPS intended to general public.

GDPS Output Data

Level	Abbreviation	Output Data	Description	Unit
L2A	LW (8)	Water leaving radiance(Lw)	Radiation intensity by band	W/m^2/um/sr
	NLW (8)	Normalized Water leaving radiance(nLw)	Normalized radiation intensity by band	W/m^2/um/sr
	KD490	Inherent optical property coefficient - Diffuse attenuation coefficient of down-welling irradiance (Kd)	Extent of solar energy being diffused as it gets deep down into seawater	m^-1
	CDOM	Colored dissolved organic matter	Amount of organic substance dissolved in seawater	m^-1
	CHL	Chlorophyll	Chlorophyll concentration included within plant plankton in seawater	mg/m^3
	TSS	Total suspended sediment	Amount of floating inorganic matte in seawater	g/m^3
	RI	Red tide index	Degree of red tide generation	-
	VIS	Underwater visibility range(visual distance)	Extent of horizontal clearness of water	m
	LAND_EVI	Enhanced vegetation index	Index that represents the vitality of vegetation	-
	LAND_NDVI	Normalized Difference vegetation index		-
	DUST_FMF	Fine-mode fraction	Value that represents the aerosol property and that is used to detect yellow sand in the sea	-
	DUST_AOT	Yellow dust - aerosol optical thickness		-
	MASK	-	Cloud(above land(3), above sea(1)), land(2), sea(0) masking information	-
L2B	A (4)	Water optical property coefficient - absorption coefficient	Absorption coefficient in four bands of 400-500nm	m^-1
	A_PHYTO(4)	Chlorophyll absorption coefficient	Chlorophyll absorption coefficient in four bands of 400-500nm	-
	A_SEDI(4)	Suspended matters extinction coefficient	Suspended matters absorption coefficient in four bands of 400-500nm	-
	A_CDOM(4)	Colored dissolved organic matter absorption coefficient	Dolored dissolved organic matter absorption coefficient in four bands of 400-500nm	-
	BB (4)	Water optical property coefficient - backscattering	Inverse diffusion coefficient in four bands of 400-500nm	m^-1

			coefficient	
	MASK	-	cloud(above land(3),above sea(1)),land(2),sea(0) masking information	-
L2C	Rayleigh Corrected Reflectance(8)	(??)	(??)	-
L2P	RRS(8)	Remote sensing reflectance	Remote sensing reflectance	sr^-1
	BF(8)	Bi-directional factor	Correction of change in value caused by sunlight and sensor	-
	Longitude	Longitude	Longitude value for each pixel	deg
	Latitude	Latitude	Latitude value for each pixel	deg
	Landmask	-	Cloud(above land(3),above sea(1)),land(2),sea(0) masking information	-
	PHV	Satellite azimuth	Satellite azimuth for each pixel	deg
	THV	Satellite zenith angle	Satellite zenith angle for each pixel	deg
	SOLA	Solar azimuth	Solar azimuth for each pixel	deg
	SOLZ	Solar zenith angle	Solar zenith angle for each pixel	deg
	COSSZ	Solar zenith angle to the cosine direction	Solar zenith angle for each pixel to the cosine direction	-
	MASK	-	Cloud(above land(3),above sea(1)),land(2),sea(0) masking information	-
L3	FGI	Fishing ground information	Information on fishery based on food quantity and surface sea temperature(MI, NOAA etc.)	-
	WQL	Water quality level	Coastal water quality grade index	-
	PP	Primary productivity	Calculation of daily primary productivity	mgC /m^2 /d
	WCV	Water current vector	Created as a separate file(*.TXT)	-
	DP	Daily data composite	Duplicate selected information out of L2A based on eight pieces of observational data	-
L3P	SST	Sea surface temperature	Entry data required for FGI and PP	deg
	PAR	Photosynthesis active radiation	Entry data required for PP	-
	DL	Day length	Length of a day	-
	MASK	-	Cloud(above land(3), above sea(1)), land(2),sea(0) masking information	-

*GDPS Ver 1.2 does not produce the IOP that belongs to L2B, which is scheduled to be available on next released version.

GDPS He5 Format

The Level 1B, Level 2, Level 3 file formats of the Geostationary Ocean Color Imager, which are available on the KOSC website is HDF-EOS V5(He5). HDF is designed to have a variety of types of data objects, including raster image, palette, text and table saved and kept in a single file and is adopted as a default format of the satellite data developed by the EOS program of NASA. HDF5 is a newly developed format to rectify and supplement the drawbacks of HDF4. HDF-EOS V5 includes the HDF 5 format and is maintained in a way similar to the HDF4-based interface. This format can be opened and viewed by HDF viewer or HDF explorer and you can obtain data as well as a variety of information on images kept in hierarchical structure, including shooting, processing and geometric correction.

GDPS Education & Public Promotion

Korea Ocean Satellite Center provides education on GDPS software, which is designed to read and process GOCI data to leverage GOCI to the fullest. Not only the regular education program but also the curriculum customized to user's request is available upon request. Those who want to participate in the education program should submit an application and consult with the personnel in charge as to time, venue and the content of education.

Technical Support

Email: gdpsinfo@kiost.ac

1.1 GDPS Ver. 1.2

GDPS Ver. 1.2 was released in March 2013, following the release of GDPS Ver. 1.1 in July 2012.

GDPS has been developed consistently with focus on two aspects. The first is to enhance the accuracy of atmospheric correction and various L2 data. The direction of ocean remote sensing is being shifted toward creating added values in actual worksites. In line with this trend, we should be able to create more accurate atmospheric correction and various L2 data. For this, we should try to improve the atmospheric correction algorithm and various L2 data algorithm based on in situ observational data and incorporate the outcome into the development of GDPS in a consistent manner. The second is to upgrade the GDPS GUI to be more user-friendly. The GUI has been upgraded in a way that facilitates ease of use along with creating more accurate data. Batch Processing Module and Rayleigh Correction Module have been added to GDPS Ver. 1.2 so that it can perform batch data process and Rayleigh image correction that was raised as issues in the 2nd GOCI PI Workshop held in January 2012.

1.2 GDPS Ver. 1.2 Screen Description

GDPS consists of "Menu", "Tool Bar", "Data Set Tree View", and "Image Display Area".

Menu: contains all GDPS functions, including "File", "View", "Analysis", "Process", "Option", "Window", and "Help".

Tool Bar: contains various functional icons that are frequently used in viewing images in the "Image Display Area".

Data Set Tree View: Upon retrieving a GOCI image, a list of bands contained in the image is displayed here. If you double-click a band, the selected image is displayed in the "Image Display Area". If you right-click the mouse upon selection of an image file or band, a popup menu that contains various convenience functions will appear.

 "Image Display Area": represents the area where GOCI images are displayed. On the popup menu displayed upon right-clicking the mouse has the function that saves the image that appears on the screen and the function that modifies or eliminates AOI.

Status Bar: Located on the bottom of GDPS, Status Bar displays functional description of icons in the "Tool Bar", magnification of the image displayed on the screen and the coordinate value of the current mouse.
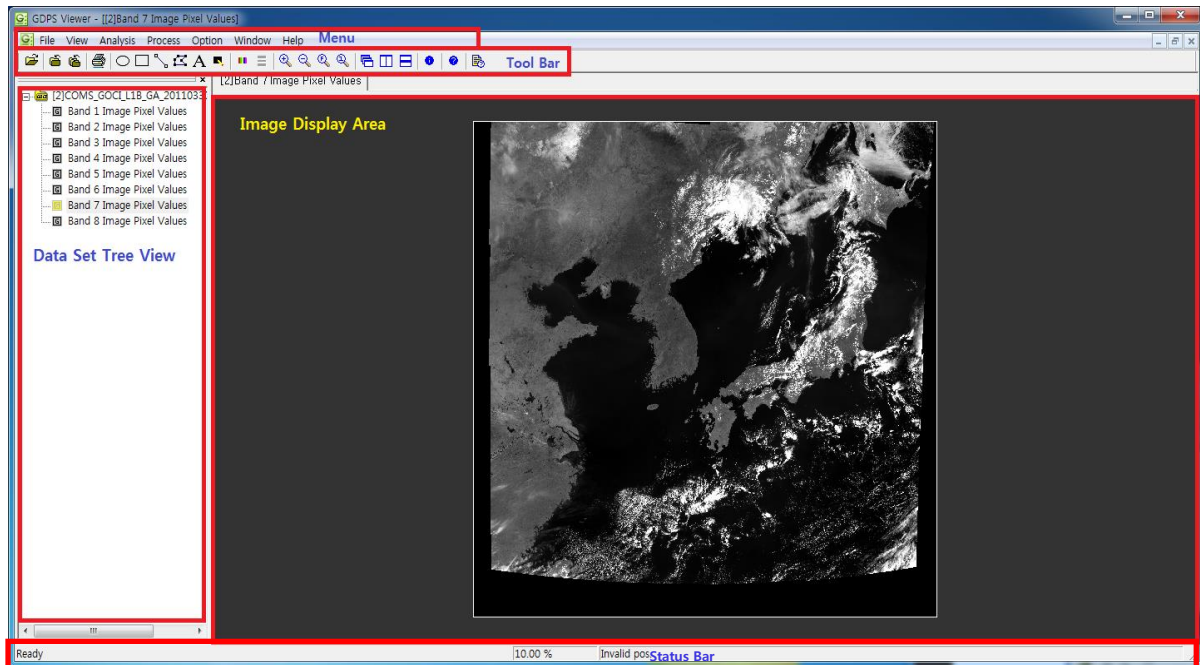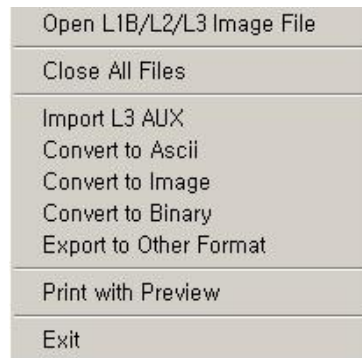

2   Menu

Menu includes a variety of GDPS functions, including "File", "View, Analysis", "Tool", "Option", "Window", and "Help".

2.1   File

This menu allows you to open or import any file that can be read by GDPS and to convert its format into the one that can be used in another program.

File Menu

1) Open L1B/L2/L3 Image File

   It opens a "GOCI Data Level L1B/L2/L3 Image File"

2) Close All Files

   It closes all files in the "Data Set Tree View".

3) Import L3 AUX

   SST and PAR are required to create L3 products (i.e. FGI and PP) and this function converts it to the He5 format of GDPS.

   Procedure

   ① Select a product to convert in the "Convert Type" (SST or PAR).

   ② Go to [Add] and select a file you want to convert.

   ③ Go to "Work Path" and select a folder to save the file in.

   ④ Executing the program by clicking [Start] will convert and save the SST and PAR data as "SST_YYYYMMDD.hdf" and "PAR_YYYYMMDD.hdf", respectively.

   ◈ There two files are created based on the data provided by the website below.

   - SST: uses G1SST file provided by JPL among GHRSST

   Relevant website:

7

- PAR: uses PAR data generated by MODIS

Relevant website: http://oceandata.sci.gsfc.nasa.gov/MODISA/L3SMI/
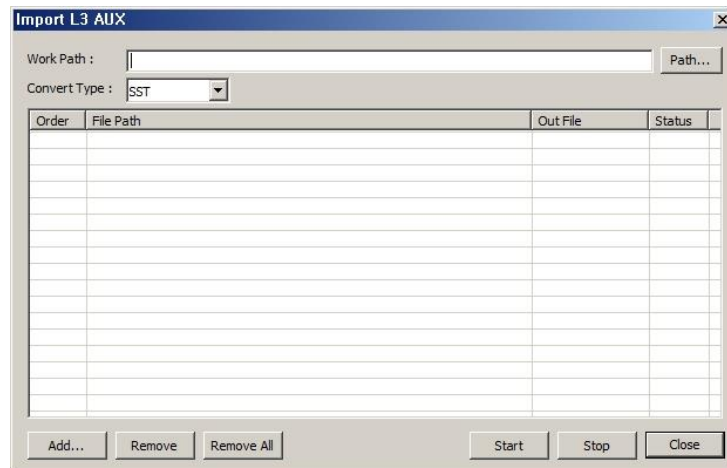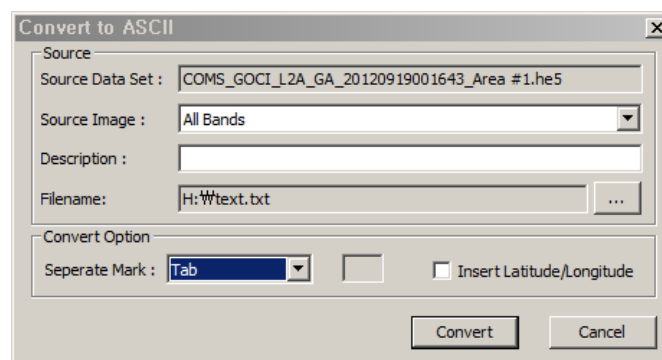

4) Convert to ASCII

It converts GOCI data to the equivalent ASCII file.

Procedure

① Go to "Data Set Tree View" and select a file you want to convert.

② Go to "File" and select "Convert to ASCII"

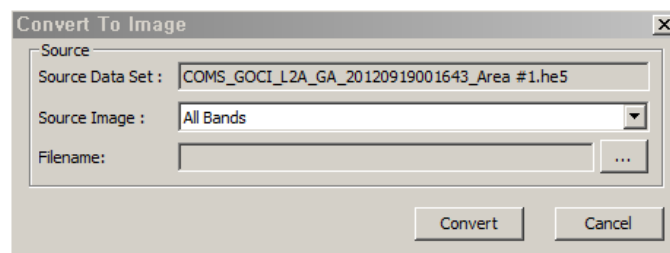- Source Data Set: allows you to import the file selected in the "Data Set Tree View" as it is

- Source Image: allows you to select a band you want to convert (all bands or a single specific band)
- Description: allows you to enter the description of the converted file
- Filename: click 〔 ··· 〕, select a folder to save the file and enter the result file name.
- Convert Option:

  A. Separate Mark: allows you to select/enter a delimiter of your choice.
 B. Insert Latitude/Longitude: allows you to include the latitude and longitude information for each point in the result file.

5) Convert to Image

It converts and saves the GOCI Data as an image format.

Procedure

① Select a file you want to convert in the "Data Set Tree View".

② Go to "File"-> "Convert to Image".

- Source Data Set: allows you to import the file selected in the "Data Set Tree View" as it is

- Source Image: allows you to select a band you want to convert(all bands or a single specific band)

- Filename: click 〔 ··· 〕, select a folder to save the file and enter the result file name.

◈ The file is saved in accordance with the color table saved in GDPS for each band.

◈ Supporting format: *.jpg, *.jif, *.jpeg, *.jpe, *.pcx, *.bmp, *.tif, *.tiff, *.png

6) Convert to Binary

It saves the GOCI Data as a binary file.
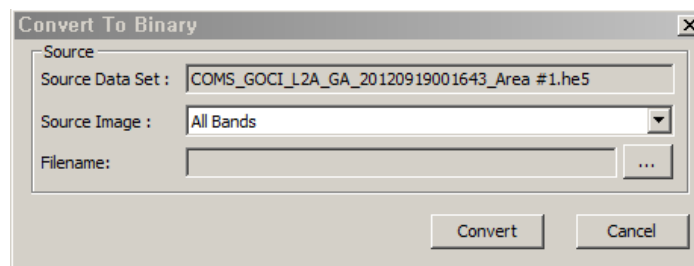
-   Source Data Set: allows you to import the file selected in the "Data Set Tree View".

-   Source Image: allows you to select a band you want to convert(all bands or a single specific band)

-   Filename: click ⋯ , select a folder to save the file and enter the result file name.

◈ The data storage method is BSQ(band sequential format) with type of data format being Unsigned Long(4byte) and Float(4byte) for L1B and L2, respectively.

7) Export Other Format

It converts the GOCI Data into the ENVI file format, one of the commercial software products for remote sensing.
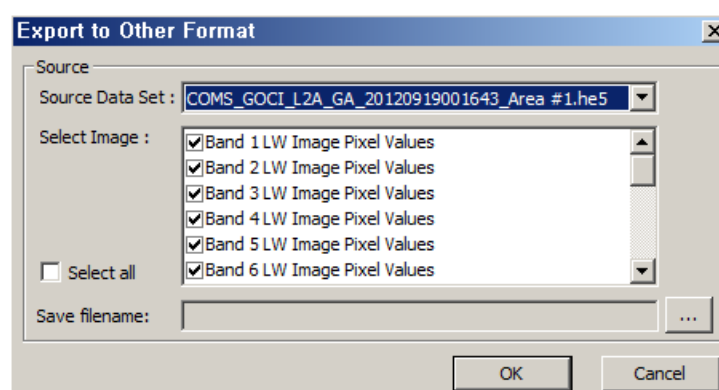
-   Source Data Set: allows you to select a file in the "Data Set Tree View".

-   Select Image: allows you to select either all or multi bands through band selection.

- Save Filename: click , select a folder to save the file and enter the result file name.

8) Print with Preview

It prints the satellite image. It provides the preview function along with margin adjustment and display of basic information on satellite image.

9) Exit

It terminates the GDPS program.

2.2 View

This menu consists of a variety of functions that facilitate a user to view images in the "Image Display Area", including Navigation, Resize image, ROI& Annotation, and Mask.
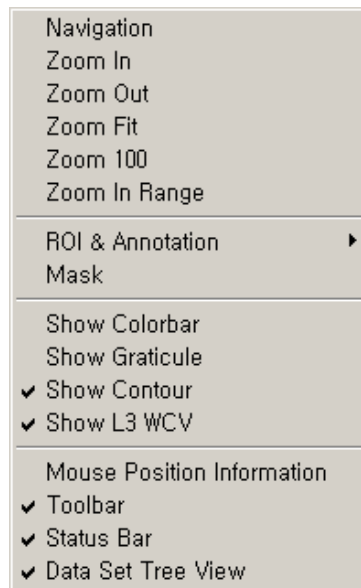
View Menu

1) Navigation

The users can move to or zoom up the desired area of the image easily with this function. The red box on the image represents the area shown on the "Image Display Area".

- [Zoom In]: increases the size of an image.

- [Zoom Out]: decreases the size of an image.

- [Zoom 100%]: resizes an image to its original size.

- [Zoom Fit]: resizes an image to fit the screen.

- [Slider Bar]: allows you to resize an image by dragging the mouse horizontally.

- [Sync]: synchronizes multiple images in a single window so that they are arranged in a synchronized manner with the same magnification.

2) Zoom In

It increases the size of an image.

◆ You can zoom in an image by [Scrolling Up] the mouse while pressing and holding the [Ctrl] key.

3) Zoom Out

It decreases the size of an image.

◆ You can zoom in an image by [Scrolling Down] the mouse while pressing and holding the [Ctrl] key.
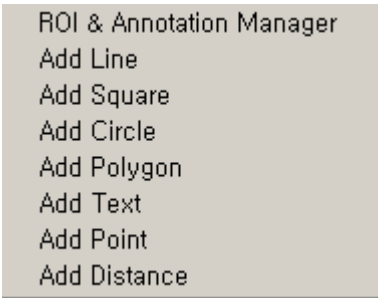
4) Zoom Fit

It resizes an image to fit the screen.

5) Zoom 100

It resizes an image to its original size.

6) Zoom In Range

It enlarges the area of an image dragged by the mouse.

7) ROI & Annotation

➤ ROI & Annotation Manager

It manages ROI(Regions of Interest) and annotation.

The object located on top of the list in the "Annotation Manager" window is displayed at the very front of the "Image Display Area".

◈ It refers to ROI and annotation as an object.

◈ You can select an object in the "Image Display Area", right-click the mouse and open it by clicking "ROI & Annotation"-> "manager".
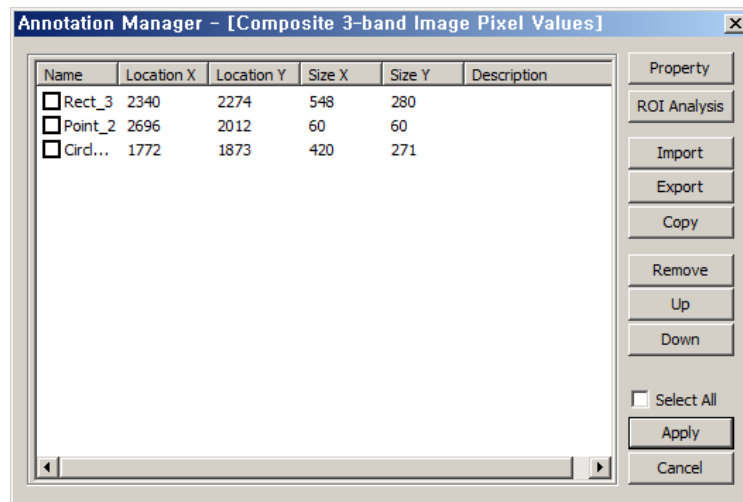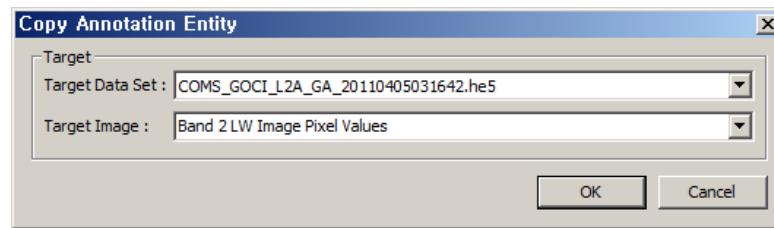
- Name: represents the shape of an object.

- Location X, Location Y: represents the location of the pixel, or the initial point of an object.

- Size X, Size Y: Size of an object

- Description: description of an object. You can enter the description in the "Property".

- [Property]: shows the property of an object.
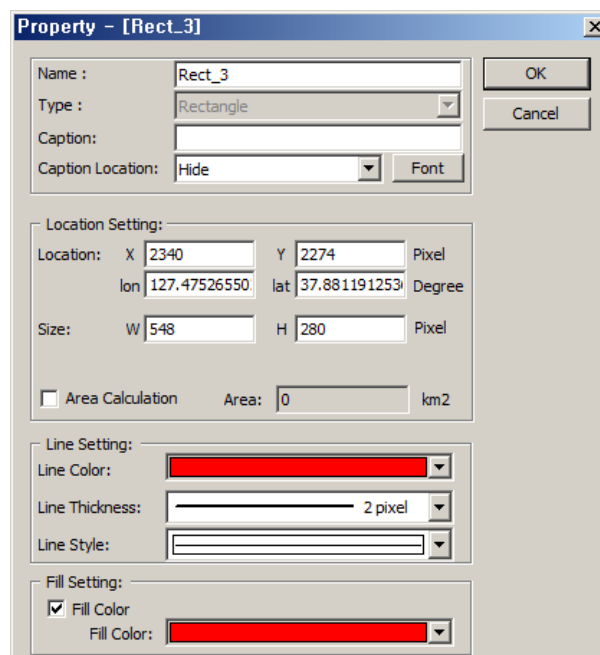
A. Name: name of an object.

B. Caption: text to be displayed on an object.

C. Caption Location: Method of sorting objects

D. Font: shape and size of characters on "Caption"

E. Location Setting

- Location X, Y: coordinates of the initial point (top left corner) of an object

- Location Lon, Lat: latitude and longitude of the initial point (top left corner) of an object

- Area Calculation: calculates the area of an object upon clicking the box.

F. Line Setting

- Line Color: color of a line

- Line Thickness: thickness of a line

- Line Style: style of a line

◈ You can open it by selecting an object in the "Image Display Area", right-clicking the mouse and selecting "ROI & Annotation"-> "property".

- [ROI Analysis]: shows statistical values of the image included in a selected object, including the histogram, minimum value, maximum value, average, and standard deviation.

- [Import]: imports an object kept in the system.

- [Export]: exports and saves an object selected by checking the checkbox.

- [Copy]: copies an object selected by checking the checkbox and pastes it onto another image imported to GDPS.

Copy Annotation Entity

Target

Target Data Set : COMS_GOCI_L2A_GA_20110405031642.he5

Target Image : Band 2 LW Image Pixel Values

OK   Cancel

A. Target

- Target Data Set: a file you want to copy.

- Target Image: a band that belongs to a file

◈ A file activated in the "Image Display Area" only is visible.

◈ You must push the [apply] button upon selecting a target file in the "Copy Annotation Entity" to apply it.

- [Remove]: removes the selected object by checking the checkbox.

◈ You can remove an object by selecting an object in the "Image Display Area", right-clicking the mouse and selecting "ROI & Annotation"->"remove", "remove all".

- [Up]: adjusts the order of overlapping objects and moves up the selected object. Select an object that you want to move up, click [Up] and then [Apply].

- [Down]: adjusts the order of overlapping objects and moves down the selected object. Select an object that you want to move up, click [Down] and then [Apply].

- [Select All]: selects all objects

◈ There are two different methods of selecting an object in "Manager"; selecting an object directly and checking the checkbox next to "Name". This function is used to the latter.

➢ Add Line

It adds a line object by dragging the mouse from the initial point to the end point.

➢ Add Square

It adds a square object by dragging the mouse from the initial point (top left corner) to the end point (bottom right corner).

➢ Add Circle

It adds a circle object by dragging the mouse from the initial point (top left corner) to the end point (bottom right corner).

◈ When it comes to the [Property] of a circle, Location X and Y represents the top left corner of the selected area and the Size W and H represents the width and height of the selected area. The selected area is seen as a white line or point when you select a circle.

➢ Add Polygon

It adds a polygon object by dragging the mouse while clicking and holding the mouse. Upon completion of drawing a polygon, double-click the mouse and a polygon is completed as the initial point is automatically connected to the end point.

◈ When it comes to the [Property] of a polygon, Location X and Y represents the top left corner of the selected area and the Size W and H represents the width and height of the selected area. The selected area is seen as a white line or point as you select and move a polygon.

➢ Add Text

It adds a text to an image. Upon clicking the mouse on the position where you add a text, the "Text property" popup appears. Write down your preferred text on the "Caption" field.

➢ Add Pont

It adds a point to an image. Upon clicking the mouse on the position where you want to add a point, a cross icon appears.

➢ Add Distance

It allows you to measure the distance between two points. If you click the mouse on the initial point and double-click on the end point, the distance between those two points is calculated. If you select multiple points on an image you will obtain the distance between the immediately linked points as well as the total distance between the initial point and the end point.
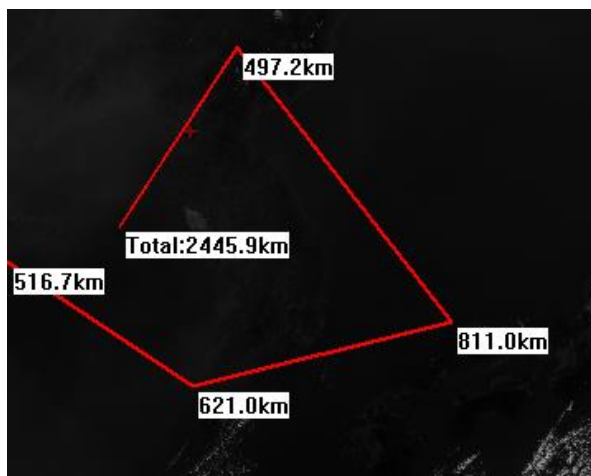
8) Mask

It exposes the Coastline/Cloud/Land areas on an image.
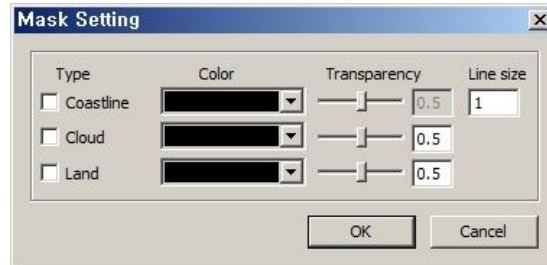
- Coastline: allows you to overlap coastlines when L1B or more images are displayed on the "Image Display Area". You can also specify the color using "Color" and adjust the thickness of the line using "Line size".

- Cloud: shows the cloud information when L2 or more images are displayed on the "Image Display Area" through the L2 processing. You can also specify the color using "Color" and adjust the degree of the transparency using "Transparency".

- Land: allows you to overlap lands when L1B or more images are displayed on the "Image Display Area". You can also specify the color using "Color" and adjust the degree of the transparency using "Transparency".

9) Show Colorbar

It displays or hides the "Colorbar" on the top left corner of the "Image Display Area".

◈ The property of "Colorbar" can be adjusted on the bottom of "color scale". See "Color Scale" for more details.

10) Show Graticule

It displays or hides the latitude & longitude information on the "Image Display Area".

◈ The property of "Garaticule" can be changed at "Option" -> "Graticule setting". See "Graticule Setting" for more details.

11) Show Contour

It displays or hides the result of contour on the "Image Display Area".

◈ "Show contour" is enabled upon calculation of contour at "Analysis" -> "Contour".

12) Show L3 WCV

It displays or hides the result of ocean current vector on the "Image Display Area".

◈ "Show L3 WCV" is enabled upon entering the result file of ocean current vector at "Analysis"-> "L3 WCV Viewer".

13) Mouse Position Information

It displays or hides the popup that shows the mouse position. If you activate the mouse position popup and click the mouse on your preferred position, the information is displayed on the popup as shown below.

-   Image-X: X pixel coordinate of an image

-   Image-Y: Y pixel coordinate of an image

-   Longitude: Longitude of an image in decimal. If you enter a longitude and press [Enter] then the longitude converted to the form of degree, minute and second are shown on the right.

- Latitude: Latitude of an image in decimal. If you enter a latitude and press [Enter] then the latitude converted to the form of degree, minute and second are shown on the right.

- Move: allows you to move the selected point by a single pixel in all direction by clicking the [up], [down], [left], or [right] button.

- Value: allows you to see the value of the selected point either in physical or pixel value by selecting your preferred option using the combo box. If the image with the selected point in it has multiple bands, you can compare the values of several different bands by exposing them all together in the "Image Display Area".

- Draw Point: Upon selecting using the checkbox, the selected point is displayed as a red cross in the "Image Display Area".

14) Toolbar

It shows or hides the "Toolbar".

15) Status Bar

It shows or hides the "Status Bar".

16) Data Set Tree View

It shows or hides the "Data Set Tree View".

2.3 Analysis

It contains additional analytical functions in addition to L2 and L3 processing.

Analysis Menu

1) Contour

It connects the points with the same value within an image with a line, and shows the results on the screen.

◈ Select the window that includes the image on which you want to draw a contour line from the windows shown in the "Image Display Area", and select "Analysis" ->"Contour".
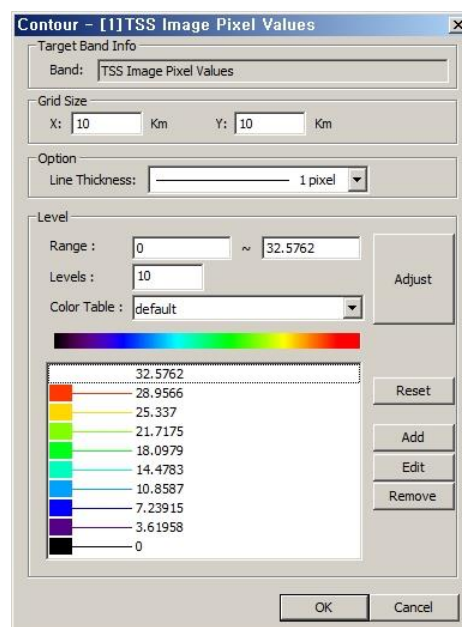
- Target Band Info: the name of the band for which you want to draw a contour line.

- Grid Size: Base distance unit for contour lines.

- Option:: Line Thickness: the thickness of a contour line

- Level

    A. Range: specifies the range values for contour lines by entering the minimum and maximum values

    B. Level: the number of contour lines to be drawn in the range specified above

    C. Color Table: select color scheme for contour lines of different levels

    D. [Adjust]: after typing in "Range", "Levels", and "Color Table", click "Adjust" to apply the setting.

    E. [Reset]: values in "Range", "Levels", and "Color Table" are reset to default values by clicking "Reset".

    F. [Add, Edit]: you can add a new contour line or edit existing ones.

      ■ Level: values for the contour line

      ■ User Sentence: you can enter a text for each contour

      ■ Line Style: the style of contour line

      ■ Line Color: the color of contour line

    G. [Remove]: removes the selected contour line

2) BandMath

It allows you to obtain the outcome calculated based on a user-defined formula using multiple bands and keep the value.
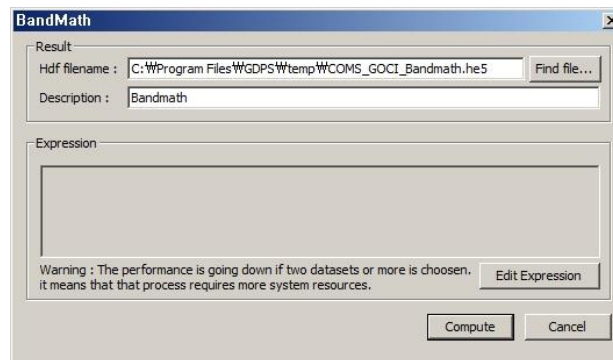
Procedure

① Select [Edit Expression] in the "BandMath" window.

② Click the ··· button in the "Target Data Image List" of the "Expression Editor" window, and select your preferred file and band.

③ Create a formula by arranging [A],[B],[C]…, functions, and numeric values with bands entered in the "Target Data Image List".

④ Click the [OK] button and the enter the result file in the "Hdf filename" of the "BandMath" window.

⑤ Click the [Compute] button.

- Result

    A. Hdf filename: the file that contains the result of the BandMath. The default folder and the file name is "C:₩Program Files₩GDPS₩temp₩COMS_GOCI_Bandmath.he5".

◈ You cannot change the default storage path and the file name. If you want to keep the result you should copy the result file in the default storage folder or change the storage path and the file name by selecting [Find file…].

- [Find File]: changes the storage path and file name.

- Description: allows you to add a description on the result, which is recorded on "HDFEOS->POINTS->File format document title" as the HDF-EOS header information.

- Expression: shows the formula set in the [Edit Expression].

- [Edit Expression]: allow you to create and save a formula.
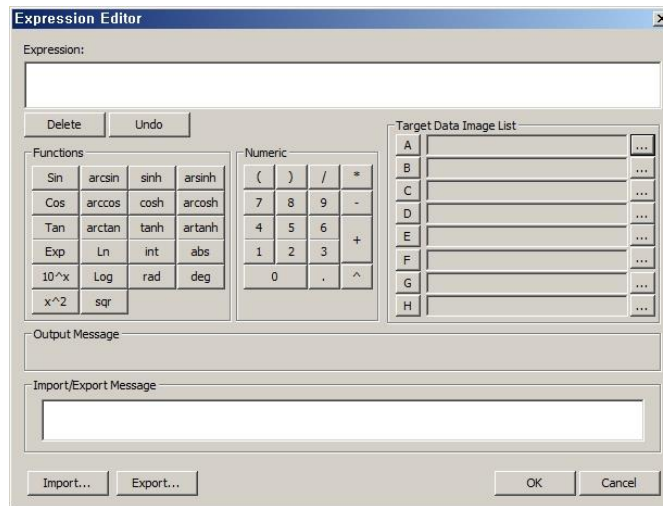
A. Expression: [A], [B], [C]... with band entered in Target Data Image List, Functions, and the window that shows the formula comprised of numeric symbols.

B. [Delete]: deletes the formula.

C. [Undo]: goes back to the previous formula.

D. Functions: a collection of mathematical functions.

E. Numeric: numbers and symbols

F. Output Message: shows the error message upon occurrence of error in the formula.

G. Import/Export Message: allow you to add a description when saving the formula as a file.

H. [Import]: imports the formula that has already been saved by the program.

I. [Export]: exports and saves the formula entered into the "Expression" window.

- [Compute]: computes the formula defined in [Edit Expression].

- [Cancel]: cancels the operation.

3) Composite 3-bands

It shows an RGB color image by synthesizing three bands.
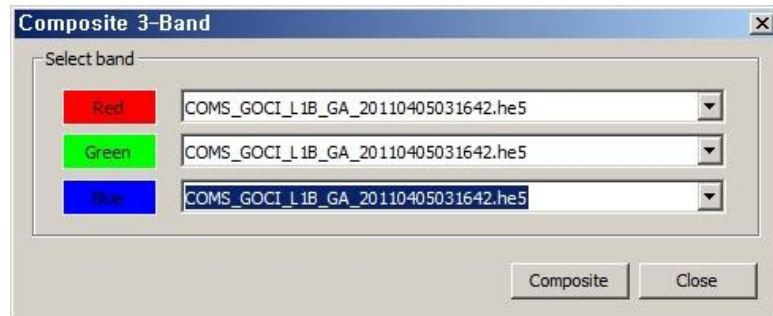
- [Select band]: allows you to select your preferred band.

4) Spectral Profile

It shows the spectrum values of multiple bands for a single pixel, and enables a user to understand the pattern in the values by connecting them. You can obtain the spectrum value for the selected point of the image shown in the "Image Display Area" either by using the mouse or by manually entering the X, Y coordinates or latitude & longitude.

◈ Up to 20 records on selected points are retained.

◈ There are five types of image that can utilize the "Spectral Profile" function as described below.

- L1B

- L2A that includes all bands of Lw

- L2A that includes all bands of nLw

- L2P that includes all bands of RRS

- L2C
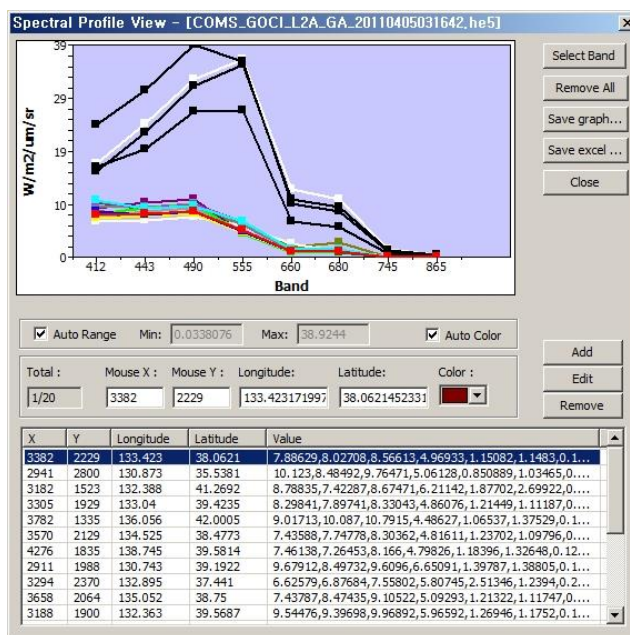
- [Select Band]: allows you to select a specific band out of eight available bands.

- [Remove All]: deletes all points registered in graph and table.

- [Save graph]: saves a graph as an image file.

- [Save excel]: saves the information recorded in the table as a Comma Separated Value(*.CSV) format.

- [Close]: terminates the "Spectral Profile".

- Auto Range: automatically adjusts the range of Y axis in the graph according to the distribution of the value in the selected point.

◈ A user can enter the minimum value and maximum value of Y axis by un-checking the checkbox.

- Min: minimum value of Y axis

- Max: maximum value of Y axis

- Auto Color: a function that automatically selects a color in the spectrum curve

◈ A user can select a color in the spectrum curve by un-checking the checkbox.

- Total: number of currently selected points/maximum selected points

- Mouse X: X coordinate of a selected point

-   Mouse Y: Y coordinate of a selected point

-   Longitude: Longitude of a selected point

-   Latitude: Latitude of a selected point

-   Color: color of the spectrum curve

-   [Add]: adds X,Y coordinates, or latitude and longitude

-   [Edit]: edits X,Y coordinate or latitude and longitude and color of a selected point

-   [Remove]: removes the selected point.

5) Histogram

It shows the basic information on an image such as value distribution and maximum and minimum values.
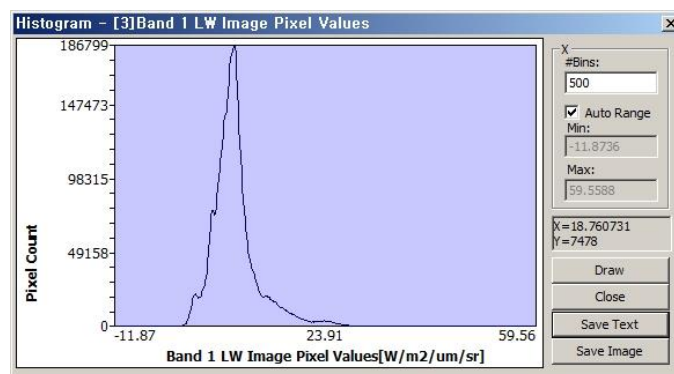
-   [Option]

    A. #Bins: the number of intervals for the values between the minimum and the maximum values which are specified in the next part

    B. Auto Range: the range of pixels values are automatically determined

    C. Min: the minimum pixel value for the histogram

    D. Max: the maximum pixel value for the histogram

E. X, Y: shows the X and Y location values in real time as the mouse is moving on the graph.

-   [Draw]: updates the histogram if there are any changes in the setting.

-   [Close]: deletes the "Histogram".

-   [Save Text]: saves of the histogram to a text file

-   [Save Image]: saves the "Histogram" graph output as an image file.

6) Scatter Diagram

It shows the degree of dispersion, or correlation between two bands.
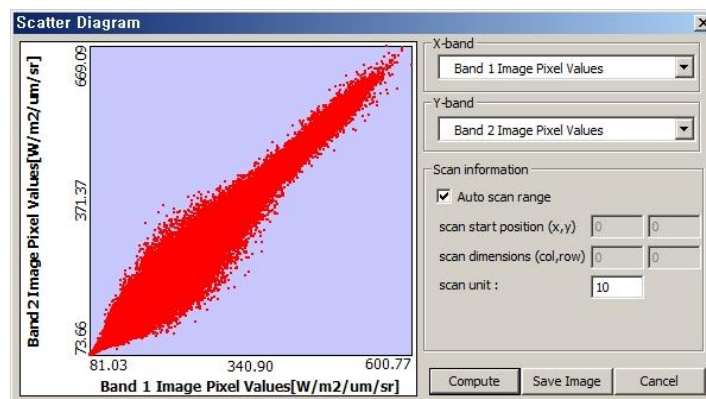
-   X-band: selects the band that corresponds to the X axis.

-   Y-band: selects the band that corresponds to the Y axis.

-   Scan information

    A. Auto scan range: automatically designates the area searched.

◈ Upon un-checking the checkbox, you can see the "scan start position" and the "scan dimensions", or "scatter diagram" in a user-designated spatial range(rectangle).

    B. Scan start position(x, y): the top left corner coordinate.

    C. Scan dimensions (col, raw): the length and width of a rectangle.

    D. Scan unit: unit expressed in the "scatter diagram".

E. [Compute]: calculates the "Scatter Diagram".

- [Save Image]: saves the result of "Scatter Diagram" as an image file.

7) L3 WCV Viewer

"L3 WCV Viewer" expresses the ocean current vector, or the L3 output in the "Image Display Area" while enabling "View"->"Show L3 WCV" as well.
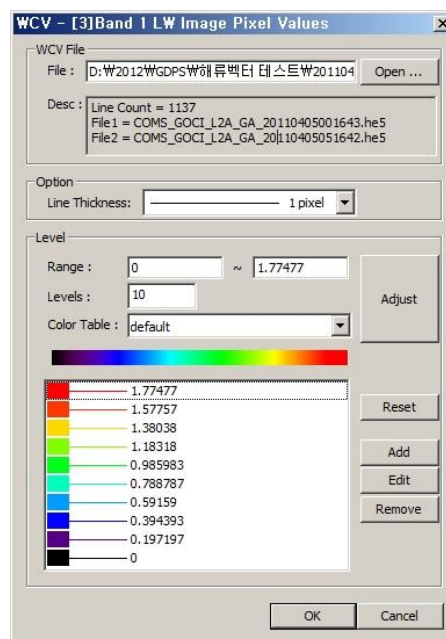
- WCV File

    A. File: allows you to enter the result of ocean current vector.

    B. Desc: the information on two images used to create the ocean current vector

- Line Thickness: the thickness of the line of the ocean current vector to be expressed.

- Level

    A. Range: the range of speed of the ocean current vector to be expressed (unit: km/h)

B. Level: the speed of the ocean current vector is differentiated by a specific level

C. Color Table: defines the color of each level.

D. [Adjust]: adjusts the display level of the ocean current vector by modifying and applying the "Range" and "Color table".

E. [Reset]: resets the value to the initial default one.

F. [Add]: adds a specific level manually.

G. [Edit]: edits the style of the line of each level, maximum value and color

H. [Remove]: deletes the selected level

2.4   Tool

It contains a group of functions to process GOCI images, which are available in GDPS only. They include "Generate L2/L3 Data", "HDF-EOS5 Data Generator", "Generate Browsing Image", "Batch Processing", "Divide Area", "Combine Area", and "Combine Time-series/Animation Tool for GDPS". They are executed independently from all GDPS functions, except "Generate Browsing Image".

1)   Generate L2/L3 Data

It allows you to create a variety of maritime data and to process data upon completion of atmospheric correction. "Generate L2/L3 Data" has been developed as a stand-alone program that is executed independently from GDPS.

◈ There are three methods to activate the "Generate L2/L3 Data".

- Go to "Tool" and execute "Generate L2/L3 Data".

- Select a L1B file imported from "Data Set Tree View", right-click the mouse and activate it by going to "Tool" and executing "Generate L2/L3 Data" (You don't have to bother to re-import the input file.)

- Select icon on the right side of "Tool Bar" and activate it at "Generate L2/L3 Data".

➢ Generate L2/L3 Data Screen Description

		Clears the screen that shows the log of the processing data.
File	Clear log	Select in the "Tool Bar". ◈ If you want to see the history log file, which contains the processing result in the past go to "C:\Program Files\GDPS\GOCI\log".
	Exit	Terminates the "Generate L2/L3 Data" program.
View	"Tool Bar"	The default is set to have "Tool Bar" visible but you may hide it by un-checking it.
	Status Bar	The default is set to have "Status Bar" visible but you may hide it by un-checking it * Satatus Bar: It is located on the bottom corner of the screen and shows the status of progress.
Run	L2 Wizard	Allows you to process the maritime data classified into L2 upon completion of atmospheric correction.

		Select [icon] in the "Tool Bar".
	L3 Wizard	Allows you to process the maritime data classified into L3 (Daily Composite, Fishery index etc.) Select [icon] in the "Tool Bar".
	L3 WCV Wizard	Allows you to process the ocean current vector. Select [icon] in the "Tool Bar".
	Processing Stop	Stops data processing while it is in progress. Select [icon] in the "Tool Bar", (Upon execution, a red circle appears.)
Help	Contents	"Generate L2/L3 Data" program manual Select [icon] in the "Tool Bar".
	About GL2Generator	"Generate L2/L3 Data" version information Select [icon] in the "Tool Bar".

➢ How to Execute L2 Wizard

① Enter L1B data

Click [...] and enter L1B entry data

33
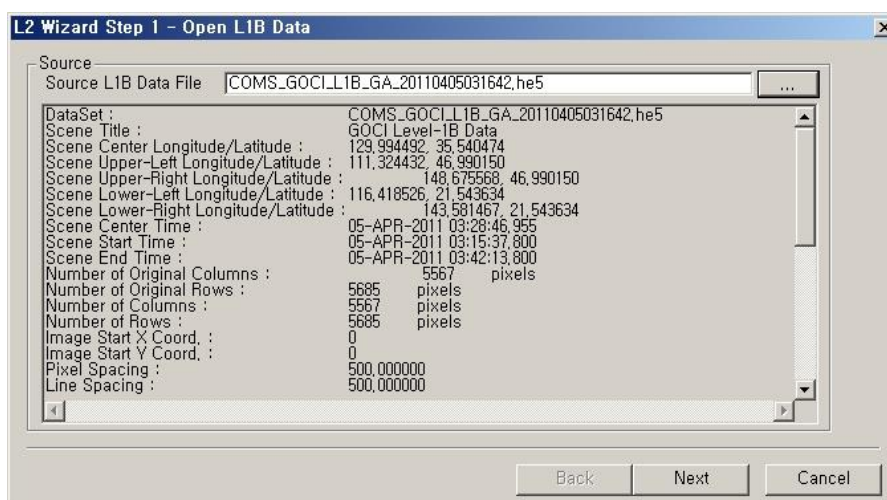
② Select L2 output that a user wants

◈ You can obtain Lw, nLw, and Rrs as default along with other outputs, which are dependent on other outputs. Therefore, a user should check which outputs to pick and calculate in advance to obtain what he or she wants through "Products relativity".

- Ex: You should pick Rrs and Chl as outputs to obtain Kd490.
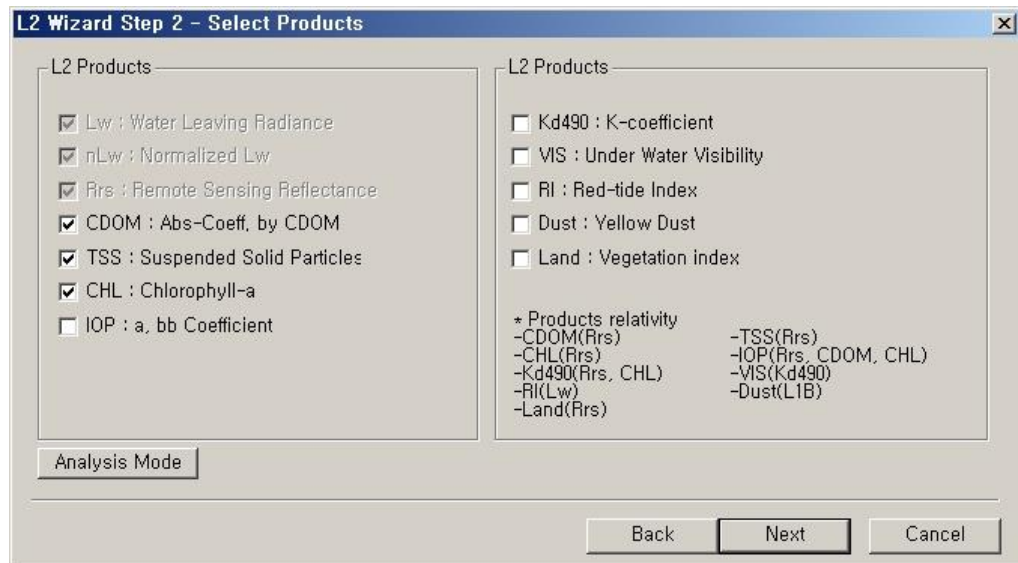
- [Analysis Mode]

A variety of algorithms are built into GDPS to obtain such outputs as Chl, CDOM, and Kd490, which are available for you to choose in [Analysis Mode].

◈ You can identify the formula in each algorithm in the "Option"->"Processing Parameter Setting".

◈ You can see the historic data on which algorithm was used to process data by referring to the header information in the "HDF-EOS5 Data Generator".

- Information position

"HDFEOS->POINTS->File Descriptor Metadata->GDPS processing algorithm"

- Unique algorithm number by output

|	AC(Lw)	CHL	KD(Kd490)	DUST(Dust scan unit)	TSS	CDOM	RI
0	SSMM	Fluorescence(Area)	Mueller(2000)	1 X 1	KOSC Standard	KOSC Standard	Band Ratio
1	KOSC Standard	Fluorescence(Difference)	Morel (2007)	4 X 4	YOC	YOC	Exponential
2	SGCA	OC2	Lee (2005)	8 X 8			RCA
3		OC3G(OC4)		12 X 12			
4		Band Ratio V2010		16 X 16			
5		YOC					

③ Select a folder to keep the output.

Designate a folder to save the file in the "Target Path" and click [Finish].

◈ Once L2A, L2B, L2C, and L2P are created as files, you can identify the output included in each file in the "GDPS output".

- A default filename is assigned, but can be modified by a user. The output storage method can be also selected through "Save Option".

  ■ Save each product data file: saves a single output as a single file.

  ■ Save each product image file: saves a single output as an image file.

  ■ Save browsing image: saves a RGB full size image and a small size image
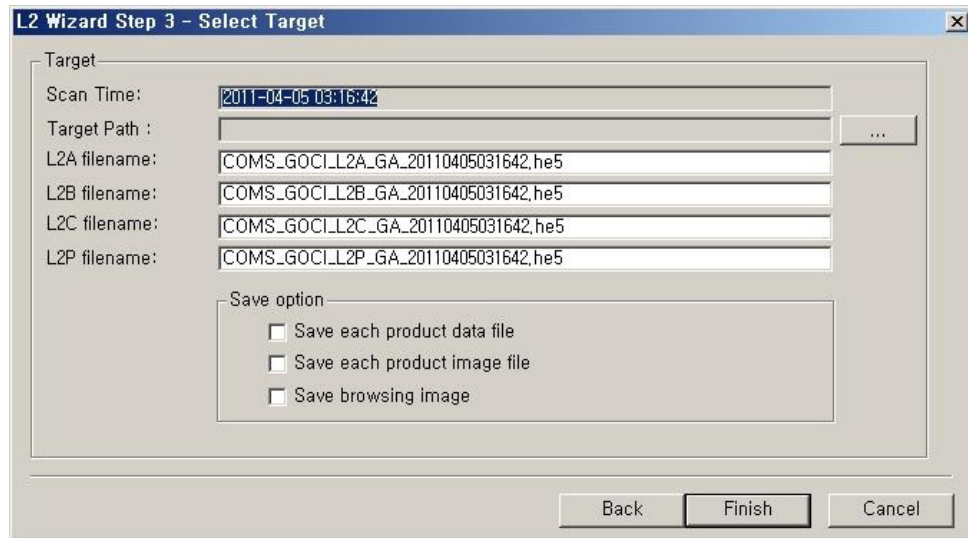
④ Process L2 output

◆ Click ![icon] on the process window if you want pause processing.
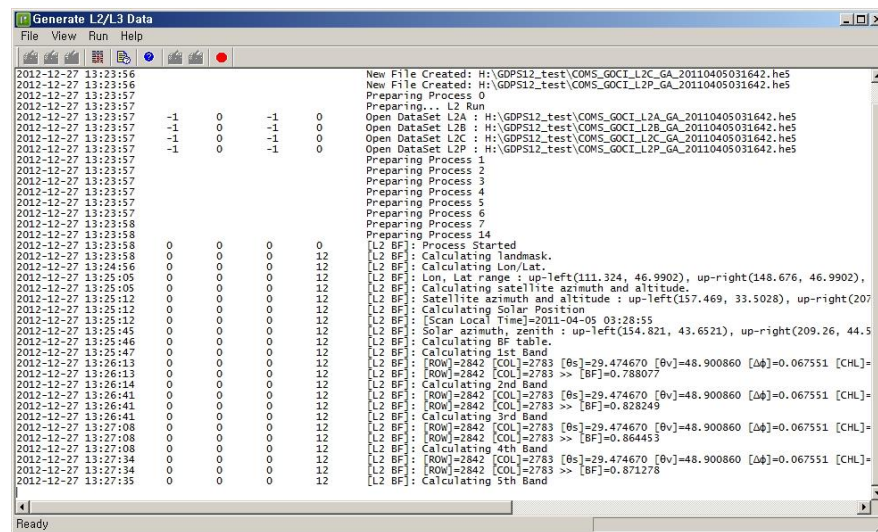
➢ How to Execute L3 Wizard

You can obtain daily synthetic data, fishery index, maritime primary production capacity, ocean current vector using L2 output data.

① Select input file that can process L3 output

◈ The PAR data used to create the SST file and PP, which are used to create eight L2A files (per day) and FGI is required and this file can be used by converting by going to "File" and executing "Import L3 AUX".
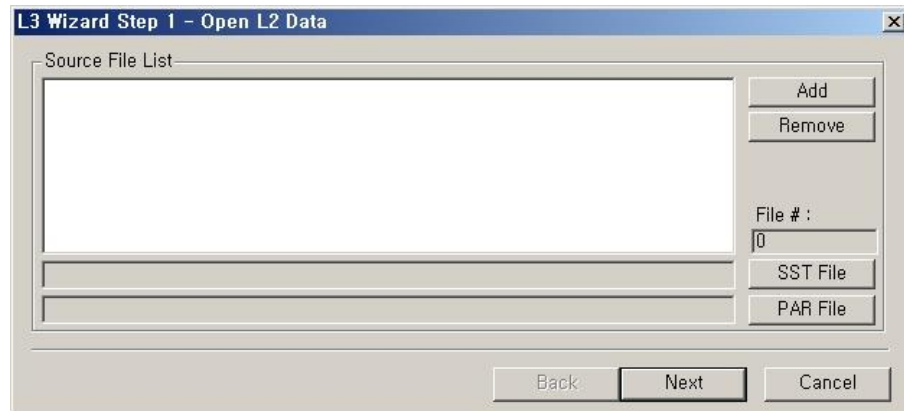
② Select L3 output

You can select a method of creating daily synthetic data, the output used to create daily synthetic data and the L3output as well.

③ Select a file to save output

Designate a folder to save the file in the "Target Path" and click [Finish].

◈ A default filename is set but can be modified by a user.

➢ How to Execute L3 WCV Wizard

A user can obtain the ocean current vector through "L3 WCV Wizard".

① Enter the input file and the result file that are used to obtain the ocean current vector.

◈ Enter two L2As that include two CHL files with time difference in filming or that include CHL in the "Source L2A File #1" and "Source L2A File #2", respectively.

◈ Result of ocean current vector

- The result of ocean current vector is saved as a text file as described below. You can the result at "View"->"Show L3 WCV" by entering the result at "Analysis"->"L3 WCV Viewer" in GDPS.

Longitude of initial point	Latitude of initial point	Longitude of endpoint	Latitude of endpoint	Direction	Speed	Correlation coefficient
1.246832e+002	3.810789e+001	1.246428e+002	3.811066e+001	2.739179e+002	1.767767e+000	1.000000e+000
1.249482e+002	3.809196e+001	1.249584e+002	3.811040e+001	2.893168e+001	1.118034e+000	1.000000e+000
1.248948e+002	3.803569e+001	1.248554e+002	3.802505e+001	2.548722e+002	1.820027e+000	9.706395e-001

2) HDF-EOS5 Data Generator

It allows you to read the header information and pixel values of L1B or higher-level products, creating a new He5 file.

◈ There are three ways to activate the "HDF-EOS5 Data Generator" as described below.

- Go to "Tool" and execute "HDF-EOS5 Data Generator".

- Select a L1B file imported from "Data Set Tree View", right-click the mouse and click "Tool"->"HDF-EOS5 Data Generator" (No need to bother to re-import the Input file)

- Select on the right hand side of "Tool Bar" to activate the "HDF-EOS5 Data Generator".

➢ "HDF-EOS5 Data Generator" Screen Description
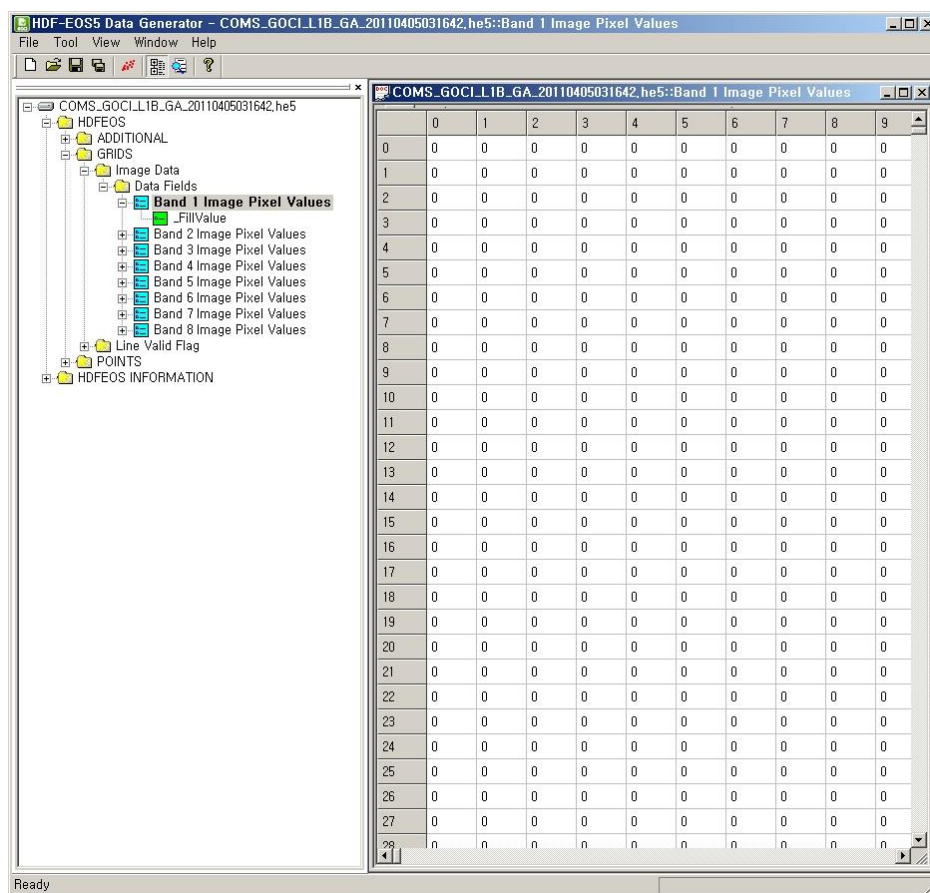
File	New	Create a new He5 file. Select [icon] in the "Tool Bar".
	Open	Open a file of L1B or higher Select [icon] in the "Tool Bar".
	Close	Close the data window.
	Save	Save the updated information in the data window Select [icon] in the "Tool Bar".
	Save all	Save all updated information. Select [icon] in the "Tool Bar".

Tool	Scatter Diagram	Show the degree of dispersion between two bands. Select ![icon] in the "Tool Bar".
View	"Tool Bar"	The "Tool Bar" is set to be visible by default but you may hide it by un-checking it.
	Status Bar	The "Status Bar" is set to be visible by default but you may hide it by un-checking it.
	Hdf Bar	The "Hdf Bar" is set to be visible by default, but you may hide it by un-checking it. Select ![icon] in the "Tool Bar".
	Search Bar	The "Search Bar" is set to be invisible by default, but you may show it by un-checking it. Select ![icon] in the "Tool Bar".
Window	Cascade	Arrange the currently open windows in a cascade.
	Tile	Resize the currently open windows to be the same size, and arrange them to fit the data window.
Help	Contents	User's manual of "HDF-EOS5 Data Generator" Select ![icon] in the "Tool Bar".
	About GataGen	Version information of "HDF-EOS5 Data Generator" Select ![icon] in the "Tool Bar".

➢ Create New File

① Go to "File" and execute "New".

② Select "GOCI Type" and enter the result file name in the "Hdf Filename".

◈ The property of data automatically changes according to the "Data Type" and a user can modify it.

◈ You may enter data through "Point information" and the supported file is he5 type.

➢ Scatter Diagram

It shows the degree of dispersion, or correlation between two bands.

① Open Scatter Diagram.

Go to "Tool" and execute "Scatter Diagram" or Select .
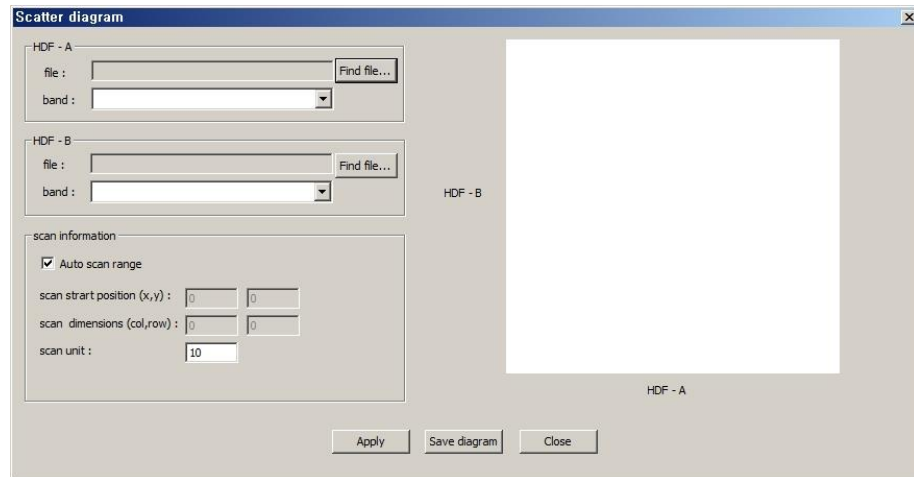
② Execute Scatter Diagram

- Enter a band file whose degree of dispersion you want to see in the "HDF-A" and "HDF-B" sections and then select a band.

- Click [Apply].
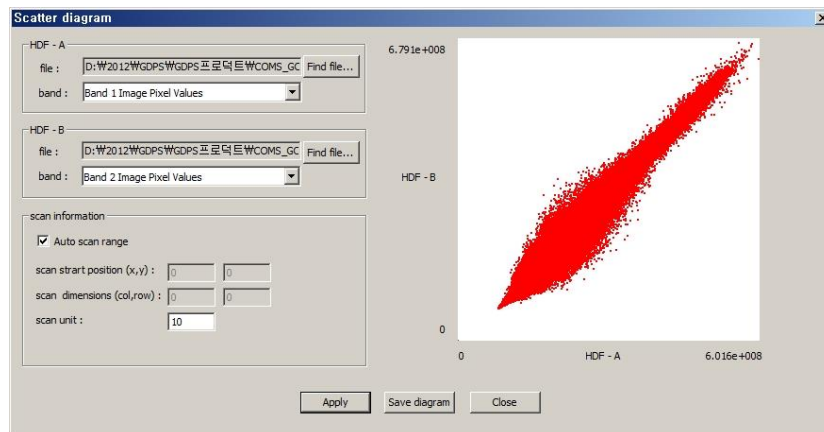
◈ Scan information

The "Auto scan range" is checked by default so the entire range is scanned. A user may also uncheck the checkbox and specify "scan start position" and "scan dimensions" to see the "scatter diagram" within a specific spatial range (rectangle).

- [scan start position(x,y)]: the coordinate of the top left corner

- [scan start position(col,raw)]: the length and width of a rectangle.

- [scan unit]: scan unit

- [Apply]: applies any change in setting values.

- [Save diagram]: saves the scatter diagram as an image.

➢ Read Header Information

The header is organized in a tree structure. If you double-click an item, you can see its detailed information on the data window.
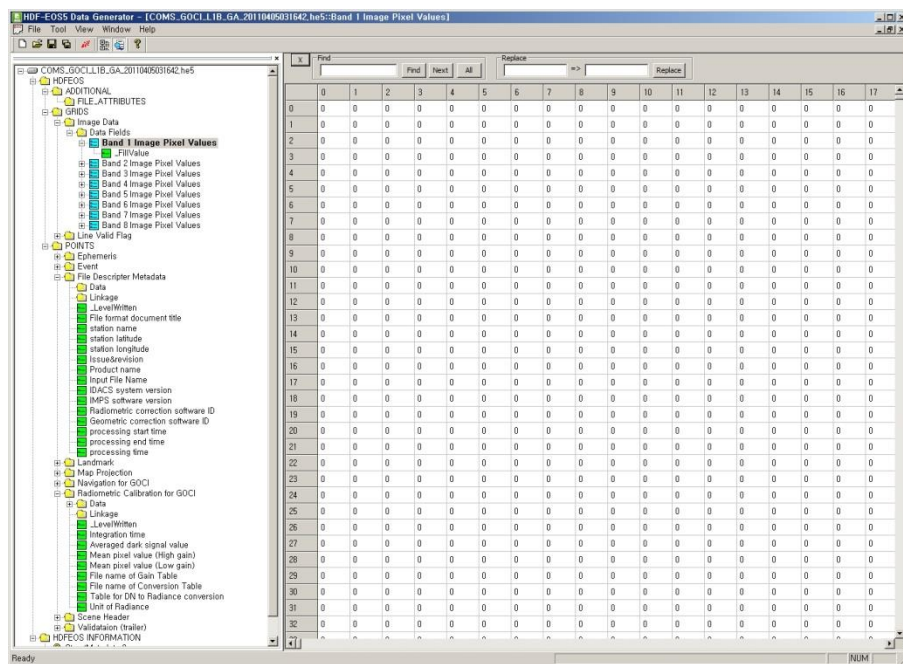
◆ Go to "Tool" and execute "Search Bar" or select to find the position of a data value.

3) Generate Browsing Image(RGB)

It creates a browsing image in three sizes of Full-size, 1000 X 1063, and 152 X 170.
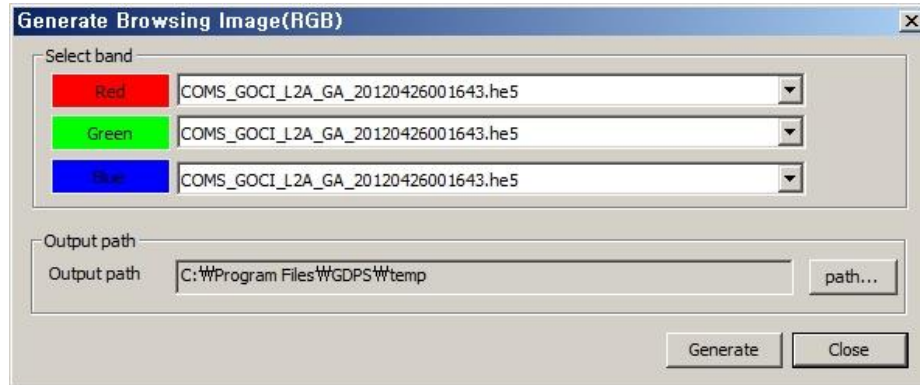
① Create browser image

- Select a band in Red, Green, and Blue list boxes, and enter the result file name in the "Output path".

- Click [Generate].

4) Batch Processing

This program is used to process multiple data items. By changing algorithm of the output, you can perform a variety of functions, including re-processing of L2 and L3, Cut Image, image format conversion, and retrieval of values in surrounding a specific position simultaneously.

◈ There are two methods of executing "Batch Processing" as described below.

- Go to "Tool" and execute "Batch Processing".

- Select on the right hand side of "Tool Bar".

➢ Screen Description of "Batch Processing"

File	Clear log	Clear the screen that shows the data processing status in real time. Select ![icon] in the "Tool Bar". ◆ If you want to see the history log of data processing, go to "C:₩Program Files₩GDPS₩GOCI₩log".
	Exit	Terminate the "Generate L2/L3 Data" program.
View	"Tool Bar"	The "Tool Bar" is checked to be visible by default, but you may hide it by un-checking it.
	Status Bar	"Status Bar" is checked to be visible by default, but you may hide it by un-checking it. * Satatus Bar: shows the data processing status in real time on the bottom corner.
Run	Batch Processing Wizard	Allows you to execute a number of functions, including L2, L3, cut image, and format conversion, and data retrieval at the same time. - A user may skip the execution of unnecessary functions in the "Tool Bar".
	Divide Area Wizard	Allows you to execute 'Cut Image' function in batch processing. You may import the retained "Area Info" to execute the function. Select ![icon] in the "Tool Bar".

	L2 Wizard	Processes maritime output data classified into L2 in batch upon completion of atmospheric correction. Select in the "Tool Bar".
	L3 Wizard	Processes maritime output data classified into L3 in batch upon completion of atmospheric correction (Daily Composite, Fishery index etc.) Select in the "Tool Bar".
	Export Wizard	Performs data format conversion in batch. Select in the "Tool Bar".
	Observation Point Wizard	Extracts data values in batch with focus on field survey points. Select in the "Tool Bar".
Help	Contents	"Batch Processing" program manual Select in the "Tool Bar".
	About GBatchProc	"Batch Processing" version information Select in the "Tool Bar".

➢ How to Execute "Divide Area Wizard"

It performs dividing multiple images into the areas of the same size.
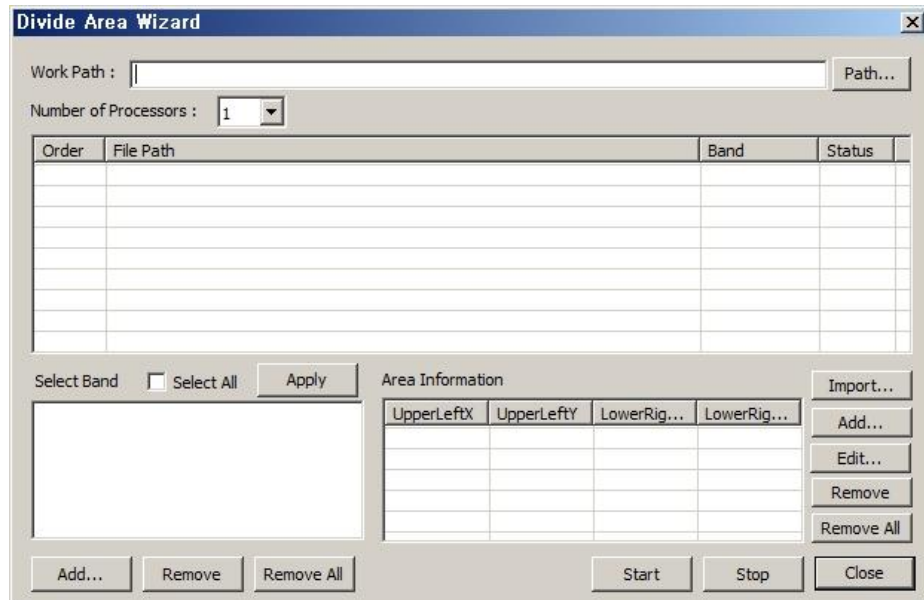
① Designate a storage path in the "Work Path".

② Determine the number of processors that can be handled at once.

③ Click the [Add] button and select a file to process.

◆Select the file list and a specific band in the "select band" and [Apply] button. Then, a user is able to select a band associated with each file.
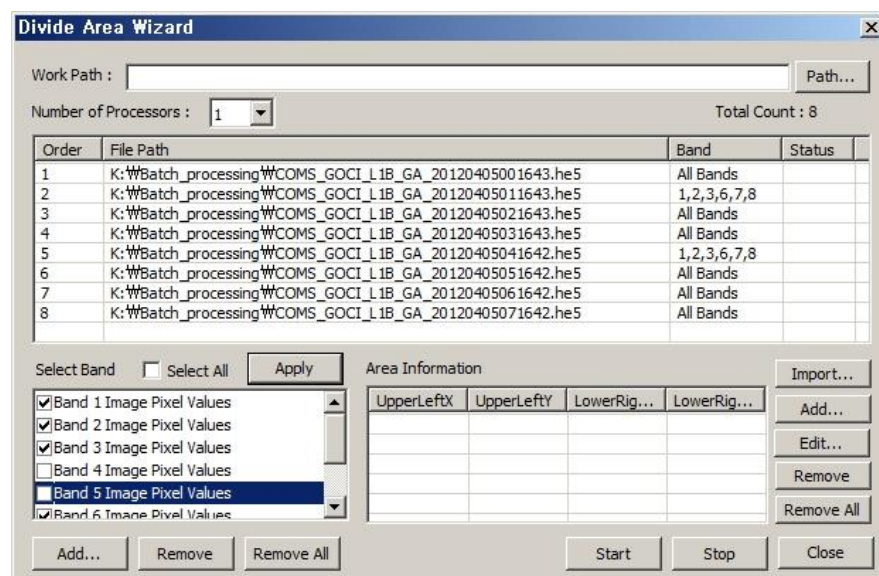
④ Designate the area to cut

  - Click the [Add] button in the "Area Information", and enter the coordinate of the top left corner of the screen.

  - Click the [Import] button in the "Area Information" and use the "Area Info" that you saved in the "Divide Area Tool".

⑤ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

➢ How to Execute L2 Wizard

It produces L2 output data from multiple L1B data.
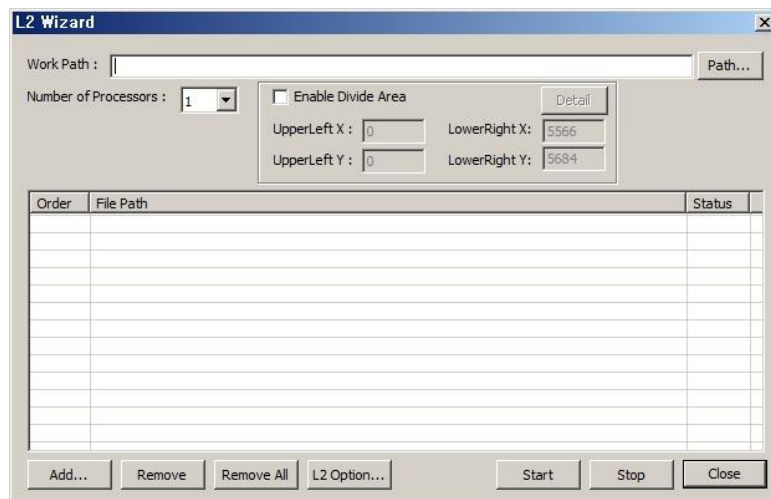
① Designate a storage path in the "Work Path".

② Determine the number of processors that can be handled at once.

③ In the case of processing L2 by cutting an image

  - Enable it by selecting the [Enable Divide Area].

  - Click the [Detail] button and enter the coordinate of the top left and bottom right corners of the screen.

④ Click the [Add] button and select a file to process.

⑤ Select the [L2 Option] and select an output and the algorithm of the concerned output.

⑥ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

➢ How to Execute L3 Wizard

It produces the L3 output from multiple data.
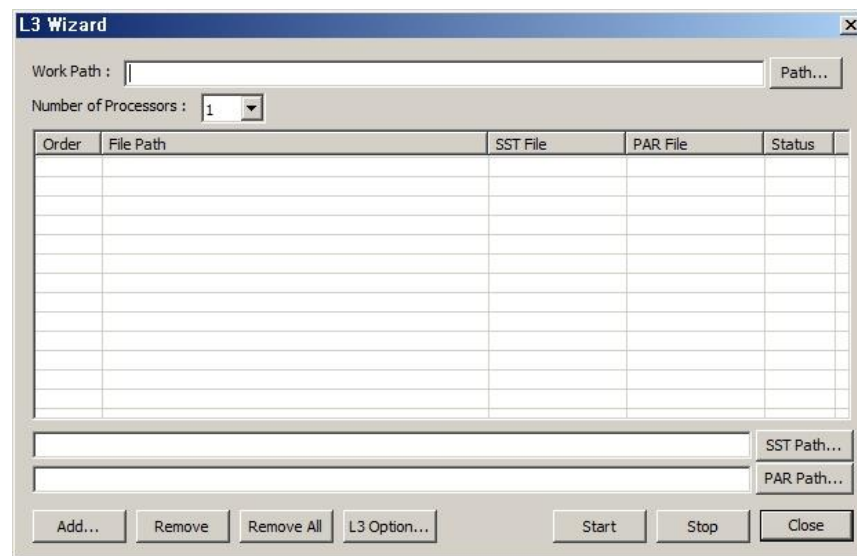
① Designate a storage path in the "Work Path".

② Determine the number of processors that can be handled at once.

③ Click the [Add] button and select a file to process.

④ Enter the [L3 Option] button and select an output and the algorithm of the concerned output.

⑤ Click the [SST Path] button to select the folder that holds the SST data required for L3 processing and click the [PAR Path] button to select the folder that contains the PAR data.

◈ The SST file and the PAR file can be converted on an as needed basis by clicking "File" -> "Import L3 AUX".

◈ The SST file is required to obtain FGI and PP and the PAR data can be read on the day of filming L3 if the file name of a SST file conforms to "SST_YYYYMMDD.hdf".

◈ The PAR file is required to obtain PP and the PAR data can be read on the day of filming L3 if the file name of a PAR file conforms to " PAR_YYYYMMDD.hdf".

⑥ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

➢ How to Execute Export Wizard

It changes the format of multiple data.
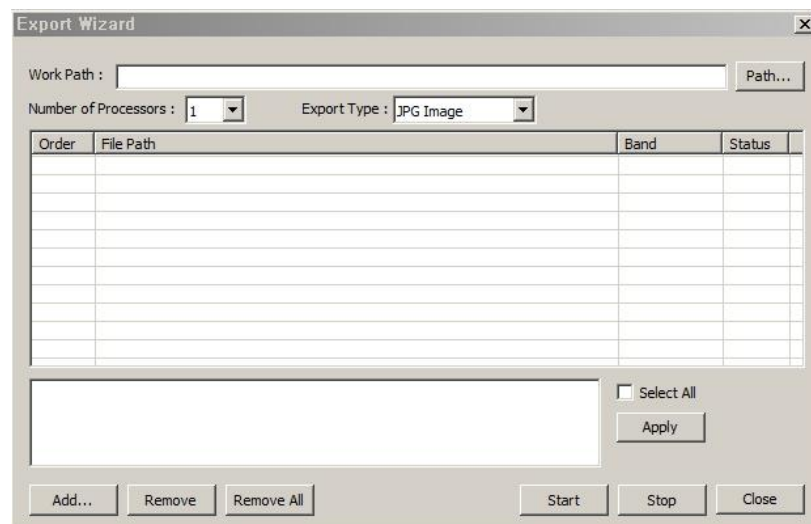
① Designate a storage path in the "Work Path".

② Determine the number of processors that can be handled at once.

③ Select a format that you want to convert to in the "Export Type".

④ Click [Add] and select a file to process.

◈ Select the file list and a specific band in the "select band", and [Apply] button. Then, a user is able to select a band associated with each file.

⑤ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

➤ How to execute Observation Point Wizard

It obtains the pixel value of the field observation point or a specific point for multiple data.
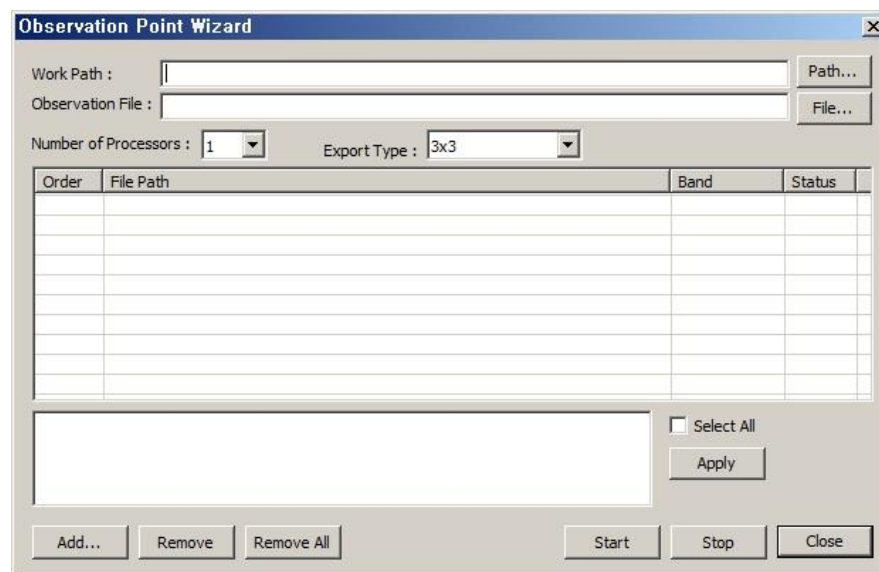
① Designate a storage path in the "Work Path".

② Save a field observation point or a specific point in text as described below, click [File...] in the "Observation File" and enter the data.

◈ Entry data format

Year month date hour min Lat. Lon.

2012 4 5 4 40 35.0232 128.8687

2012 4 5 3 40 35.0232 128.8687

2012 4 5 2 40 35.0232 128.8687

③ Determine the number of processors that can be handled at once.

④ Select a type of expression in the "Export Type" (1x1, 3x3).

⑤ Click the [Add] button and select a file to process.

◆ Select the file list and a specific band in the "select band" and [Apply] button. Then, a user is able to select a band associated with each file.

⑥ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

➤ How to execute Batch Processing Wizard

It executes a series of functions, including L2, L3, image cut, format conversion, and data extraction in a batch.

◆ You are allowed not to select the function you don't need.

① Designate a storage path in the "Work Path".

② Determine the number of processors that can be handled at once.

③ In the event of processing L2 by cutting the image

53

- Click the [Add] button in the "Area Information" and enter the coordinate of the top left and bottom right corners of the screen.

- Click the [Import] button in the "Area Information" and use the "Area Info" set in previous "Divide Area".

④ Select "Enable L2" for processing L2, and click the [L2 Option] button to select the output and the algorithm of each output.

⑤ Select "Enable L3" for processing L3, and click the [L3 Option] button to select the output and the algorithm of each output.

-   Select the folders for SST data and PAR data in the "SST Path" and "PAR Path", respectively.

⑥ To perform data format conversion, select "Enable Export", select the format in the "Export Type", click the [Option] button, and select the band to convert.
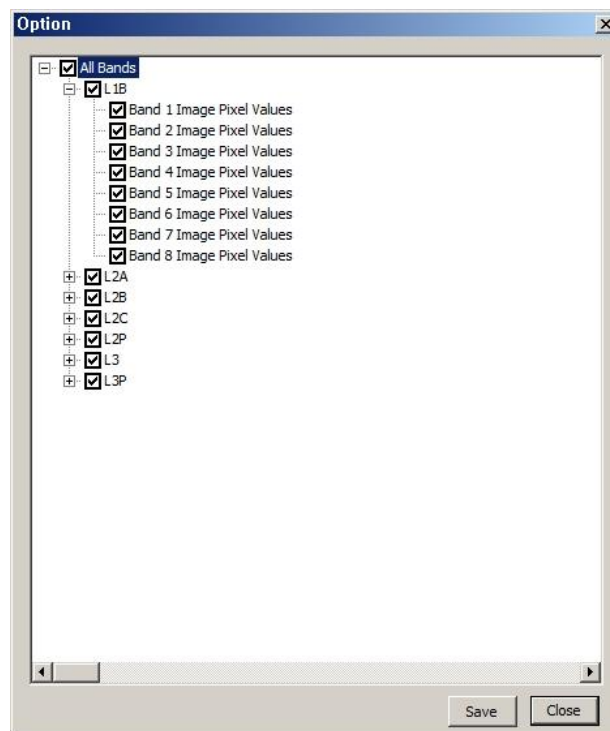
⑦ To extract the pixel value of the observation point, select "Enable Observation Point" and select a type of export in the "Export Type".

- Click the [Option] button, select the band to convert and enter the observation point in the "Observation File".

⑧ Click the [Add] button and select a file to process.

⑨ Click the [Start] button to execute the function and click the [Stop] button to terminate it while in execution.

5) Divide Area

The GOCI data covers the entire ocean of the Northeast Asia including the Korean peninsula. However, the user's interest area may be much smaller than that. This function allows a user to specifically cut apart the image of his or her interest, which saves time in processing L2 and L3.

◈ There are three different ways to activate the "Divide Area" as described below.

- Go to "Tool" and execute "Divide Area".

- Select a L1B file imported from "Data Set Tree View", right-click the mouse and activate it by selecting "Tool"->"Generate L2/L3 Data" (You don't have to bother to re-import the input file.)

- Select on the right-hand side of "Tool Bar".

➢ "Divide Area" Screen Description
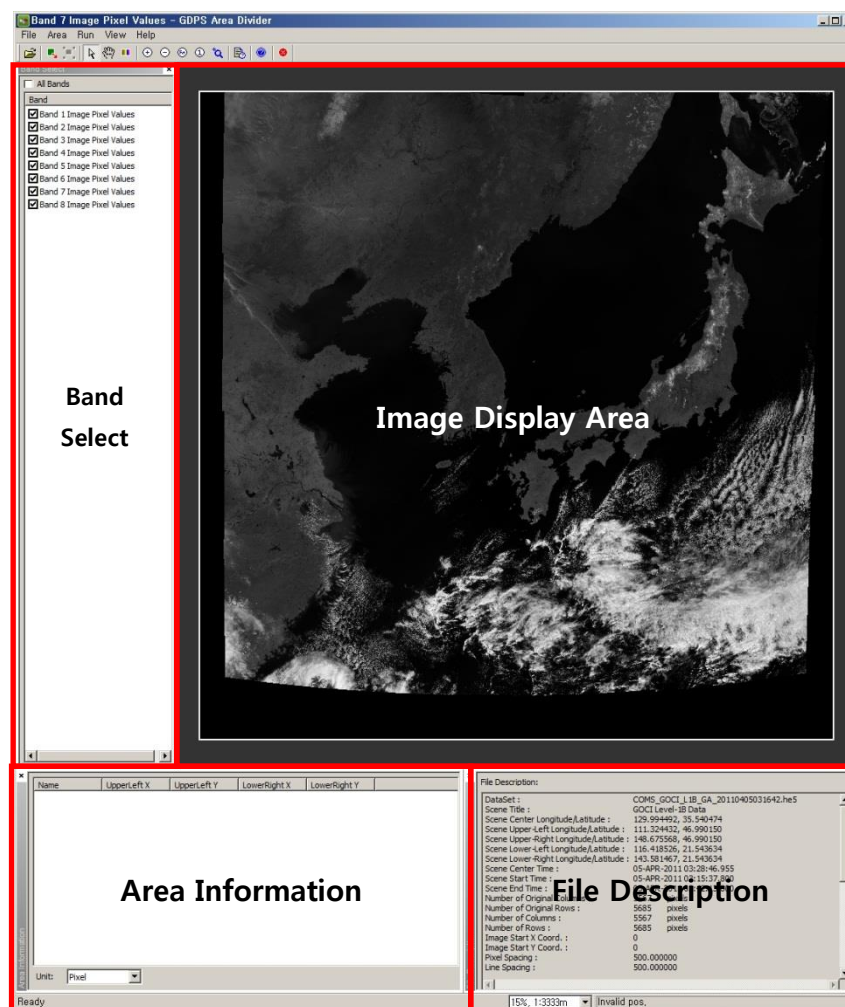
- Band Select: allows a user to select a specific band or all bands.

◈ None of the bands are selected by default, but you should select a band to cut the image. You may select all bands by selecting [All Bands].

- Image Display Area: The image you want to cut appears as a single band. If you double-click a band that you want to show in the "Band Select", the image appears in the "Image Display Area".

- Area Information: shows the coordinates of the top left and bottom right pixels of the image you want to cut.

◈ Change and delete "Area Information".

- If you double click the coordinate information, the "Detail Area Info" popup window appears. In this popup, you can cut the image of your preferred size based on the latitude and longitude

information obtained by converting between top-left and bottom-right pixels and latitude / longitude coordinates.

- You may delete the "Area Info" by selecting the coordinate information, right-clicking the mouse and selecting [Delete].

- File Description: shows the information on the file you want to cut

File	Open	Opens L1B file or higher. Select [icon] in the "Tool Bar".
	Color scale	Controls the color properties of the image shown on the "Image Display Area" such as "color table", "min", "max", and "color bar". See "Option" -> "Color scale" for more details. Select [icon] in the "Tool Bar".
	Exit	Terminates the program. Select [icon] in the "Tool Bar".
Area	Draw Area Box	The area you want to cut apart in the "Image Display Area" is drawn in the form of rectangle. Select [icon] in the "Tool Bar".
	Open Area Info	Imports the retained rectangle information (Area Info.).
	Save Area Info	Saves the information of the rectangle (Area Info.) drawn by "Draw Area Box".
Run	Run divide	Cut images.

View	Navigation	Facilitates the relation of an image with the red box representing the image that appears on the "Image Display Area".
	Zoom	Resizes images. Select ⊕ ⊖ ⊛ ① 🔍 in the "Tool Bar".
	Area Information	"Area Information" window is set to be visible by default, but you may hide it by un-checking it.
	File Description	The "File Description" window is set to be visible by default, but you may hide it by un-checking it.
	Band Select	The "Band Select" window is set to be visible by default ,but you may hide it by un-checking it.
	Show Color bar	The "Color Bar" window is set to be invisible by default, but you may hide it by un-checking it.
	Tool Bar	The "Tool Bar" window is set to be visible by default, but you may hide it by un-checking it.
	Status Bar	The "Status Bar" window is set to be visible by default, but you may hide it by un-checking it.
Help	GAreaDivider Help	User's manual of "Divide Area" Select 📑 in the "Tool Bar".
	About GAreaDivider	Version information of "Divide Area" Select ◉ in the "Tool Bar".

➢ Cut Image

① Click "Area"->"Draw Area Box" and drag the mouse while right-clicking and holding the mouse until you obtain your preferred size.
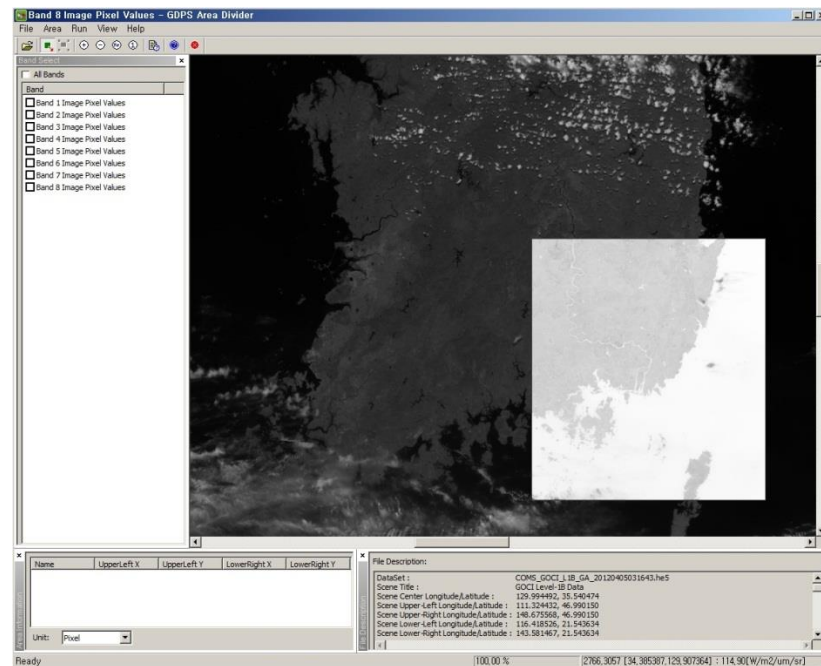
◈ When it comes to selecting the area, you may designate a user's area by importing the retained information through the "Save Area Info".

◈ You can delete or modify the "Area Info" in the "Area Information" window.

② Select a band you want to cut in the "Band Select".

◈ No band is selected by default but it is required to select a band to cut the area apart from the image or you may select all bands through "All Bands".
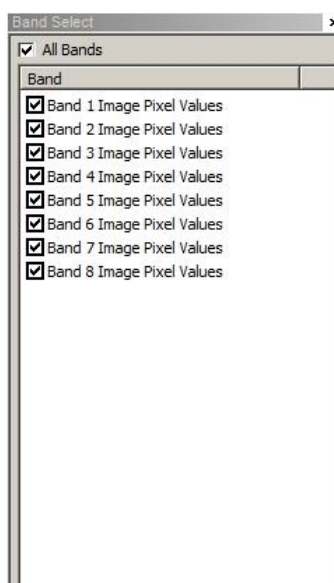
③ Go to "Run", and execute "Run Divide" to cut image.
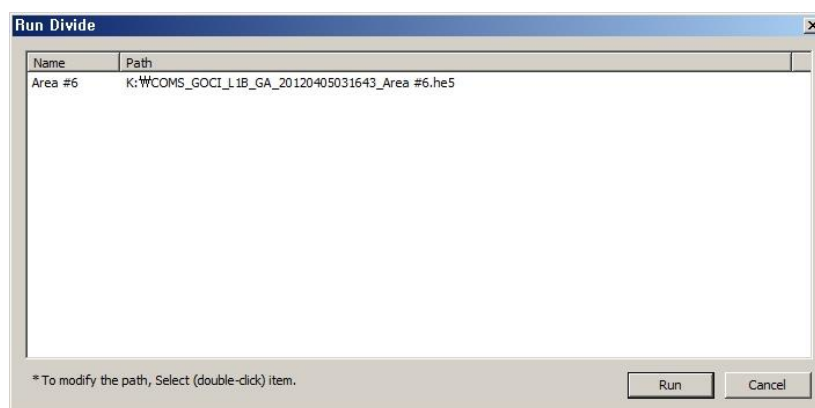
◈ The name and storage path of a file to be saved is set to be in the parent folder of the original file, but you may change the folder by double-clicking the result file name.
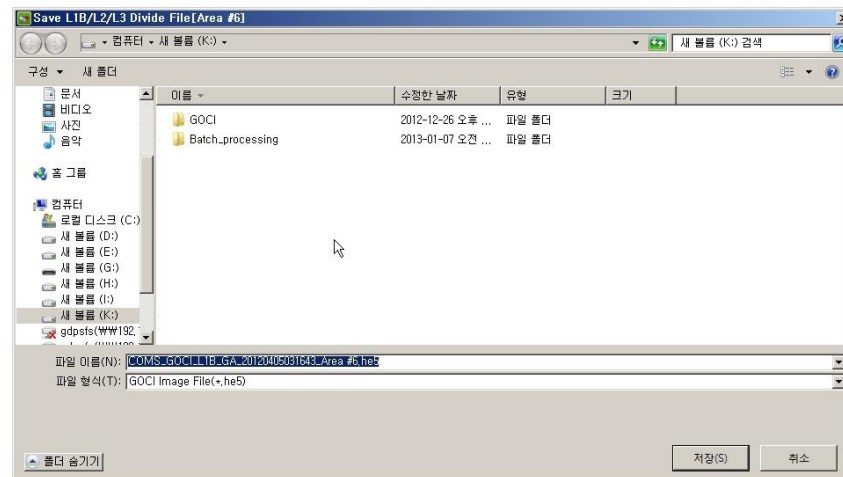
6) Combine Area

It combines files fragmented by "Divide Area" into a single file.

◆ There are two ways to activate "Combine Area" as described below.

- Go to "Tool" and execute "Combine Area".

- Click on the right hand side of "Tool Bar".

➢ "Combine Area" Screen Description
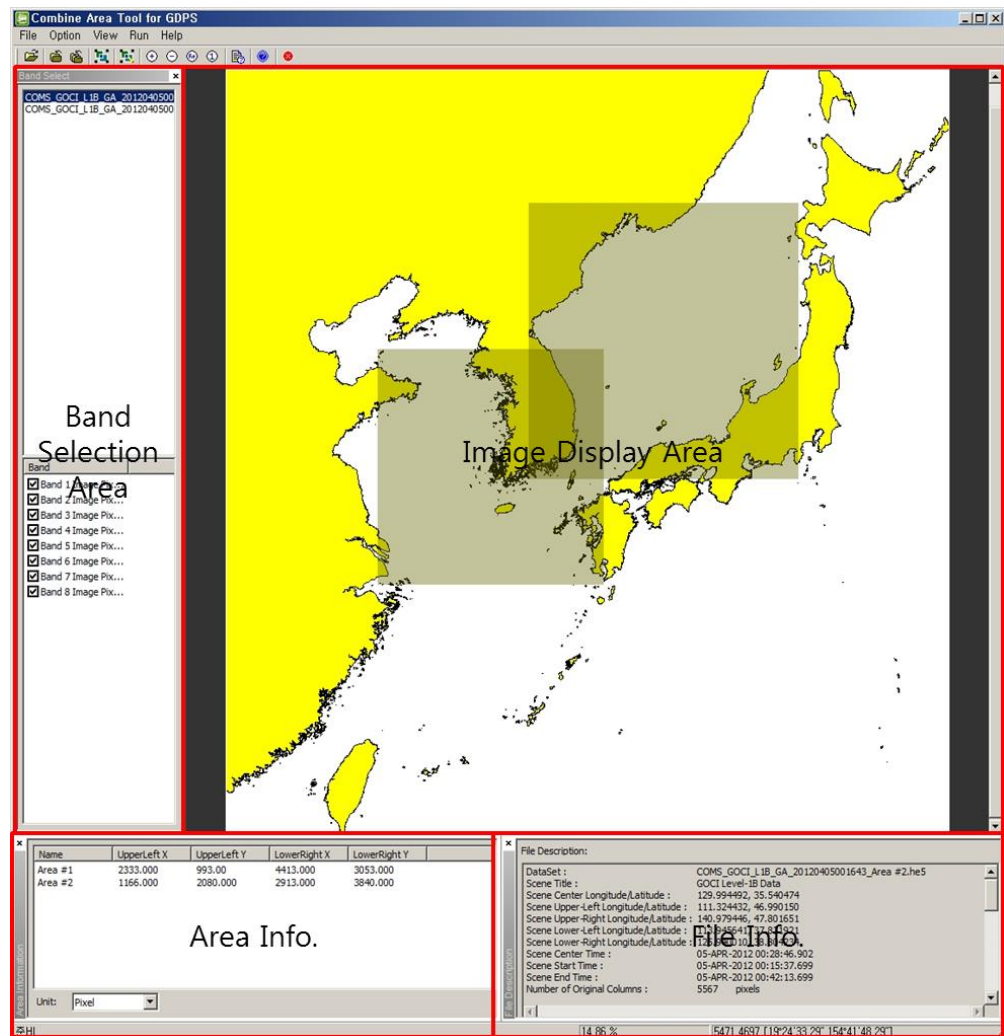
- Band Select: shows files you can combine. If you select a file whose bands you want to combine, the list of bands you can combine is shown on the window below.

- Image Display Area: shows the image with the background divided into the sea and the land. The files listed in the "Band Select" are represented as gray rectangles in the "Image Display Area" so that you can identify the overlapped range.

- Area Information: shows the coordinates of the top-left and bottom-right pixels on an individual file.

- File Description: shows the information on the file to combine.

|		
File	Add File	Open a file of L1B or higher to combine.
	Close File	Remove the file selected in the "Band Select". Select ⬚ in the "Tool Bar".
	Close All	Removes all files listed in the "Band Select". Select ⬚ in the "Tool Bar".
Option	Combine Option	Selects the method of calculating the pixel of the overlapped area. - There are " Max", "Min", and "Avg" as options with the "Avg" set by default. Select ⬚ in the "Tool Bar".
Run	Run divide	Execute cutting images. Select ⬚ in the "Tool Bar".
View	Zoom	Resizes images. Select ⊕ ⊖ ⊛ ① 🔍 in the "Tool Bar".
	Area Information	The "Area Information" window is set to be visible by default, but you may hide it by unchecking the checkbox.
	File Description	The "File Description" window is set to be visible by default, but you may hide it by un-checking the checkbox.
	Band Select	The "Band Select" window is set to be visible by default, but you may hide it by un-checking the checkbox.
Run	Run Combine	Combines two or more images.
Help	Contents	"Divide Area" program manual. Select ⬚ in the "Tool Bar".
	About Combine Area Tool	"Combine Area" version information Select ⬚ in the "Tool Bar".

➢ Join Image

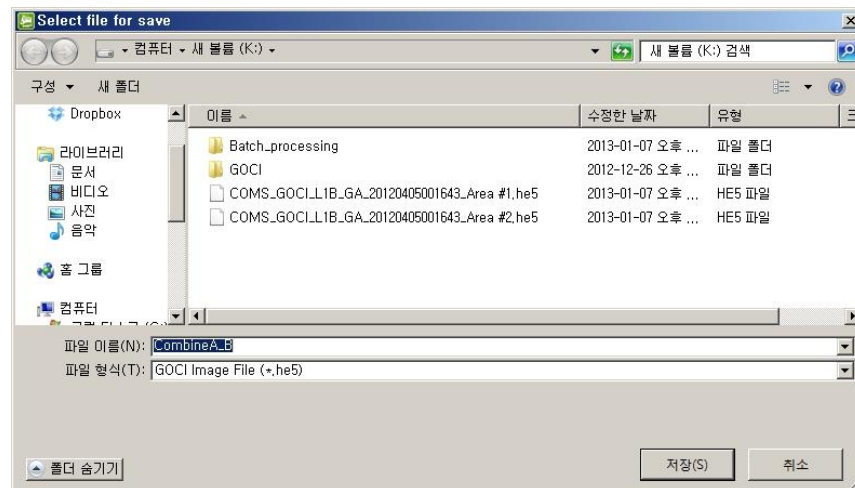① Retrieve images to join by clicking "File"->"Add File".
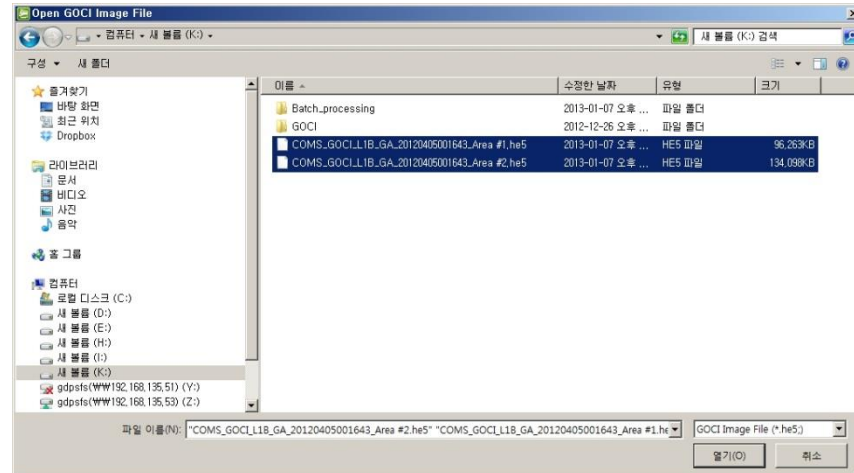
② Select the band of the file to join.
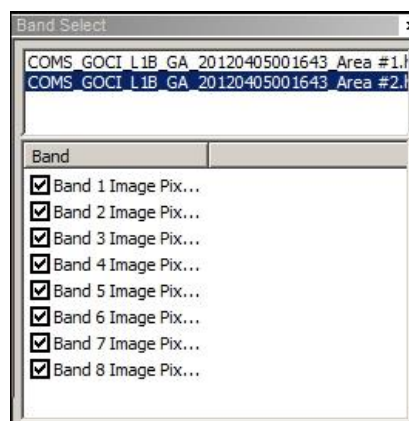
③ Go to "[Option]", execute "Combine Option", and select the method of synthesizing pixels in the overlapped area.
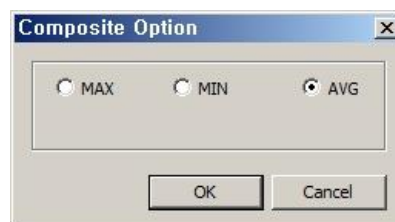
④ Go to "Run", and execute "Run Combine" to execute joining images.

7) Combine Time-series/Animation Tool for GDPS

GOCI allows you to observe the Northeast Asia eight times a day, 365 days a year. To take advantage of this capability, the function that performs time-series image synthesis and facilitates the identification of changes in image by animating a series of images has been developed.

◈ There are two ways to activate "Combine Time-series/Animation Tool for GDPS" as described below.

- Go to "Tool" and execute "Combine Time-series/Animation Tool for GDPS".

- Select on the right hand side of the "Tool Bar".

➢ "Combine Time-series/Animation Tool for GDPS" Screen Description
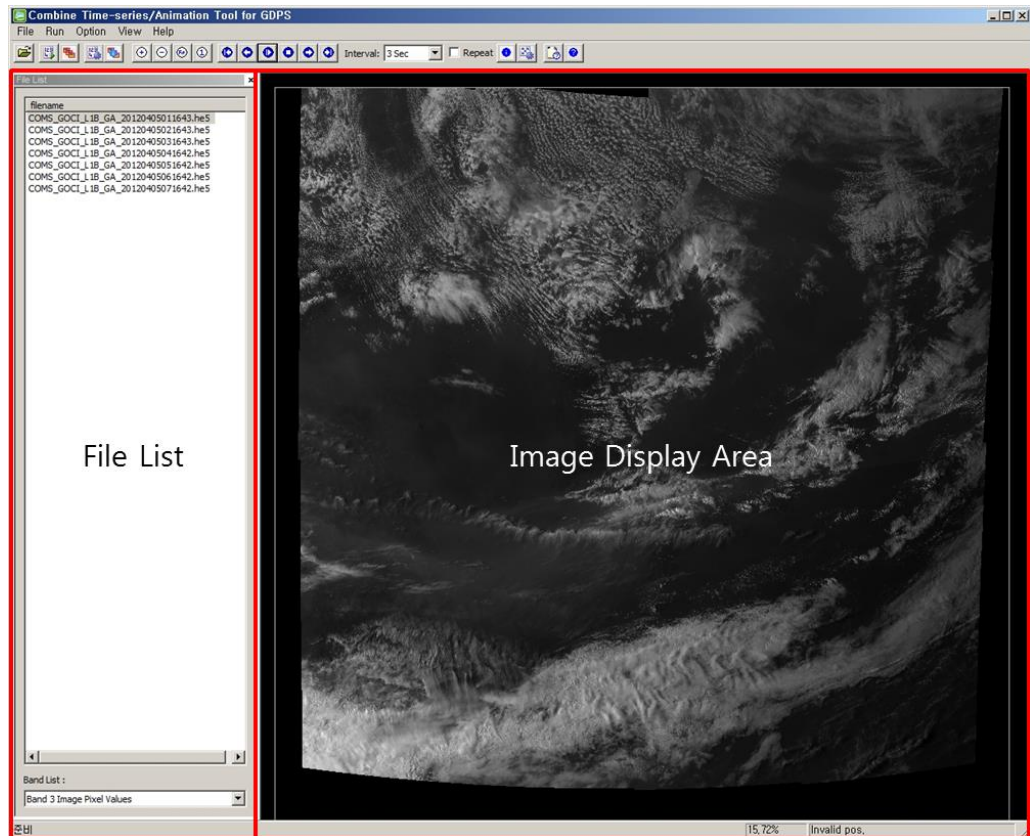
- File List: the data required for time-series synthesis or animation.

◈ Select a file in the "File List" and right-click the mouse.

- Add: adds an input file.

- Remove: removes the selected file from the "File List".

- Remove all: removes all files listed in the "File List".

- File Information: shows the information of the selected file.

- Image Display Area: shows the time-series synthesis and animation.

File	Add	Adds data. Select ![icon] in the "Tool Bar".
	File Information	Shows the information on the file selected in the "File list". Select ![icon] in the "Tool Bar".
	Animation Frame Information	Shows the information on "Animation Frame" such as size and input data. Select ![icon] in the "Tool Bar".
	Exit	Terminates the program.
Run	Run Composite Time-Series	Executes time-series image synthesis Select ![icon] in the "Tool Bar".
	Make Animation Frames	Creates an animation. Select ![icon] in the "Tool Bar".
Option	Color scale	Controls the color properties of the image shown on the "Image Display Area" such as "color table", "min", "max", and "color bar". See "Option" -> "Color scale" for details. Select ![icon] in the "Tool Bar".
	Combine Time-Series Option	Selects the method of performing time-series image synthesis. Select ![icon] in the "Tool Bar".
	Display Setting	Selects the image shown on the "Image Display Area" and resizes it. The animation on the "Image Display Area" is displaced upon selecting the "Show Animation Frame". Select ![icon] in the "Tool Bar".
View	Navigation	Facilitates the relation of an image with the red box representing the image that appears on the "Image Display Area".
	Zoom	Resizes images.

|		Select ⊕ ⊖ ⊛ ① 🔍 in the "Tool Bar".
	File List	The "File List" window is set to be visible by default but you may hide it by un-checking the checkbox.
Help	Contents	User's manual of "Combine Time-series/Animation Tool for GDPS". Select 📄 in the "Tool Bar".
	About Combine Time-series/Animation Tool	Version information of "Combine Time-series/Animation Tool for GDPS". Select ◉ in the "Tool Bar".

➢ Synthesis of Time-Series Image

① Retrieve the input files required for time-series image by clicking "File"->"Add".
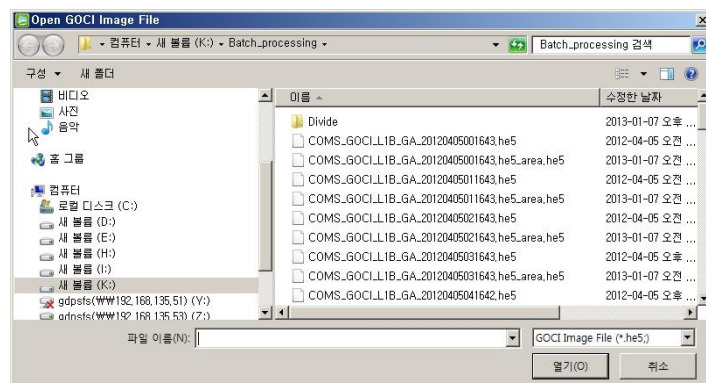
② Go to "[Option]", execute "Combine Time Series Option", and select the method of synthesizing the image.
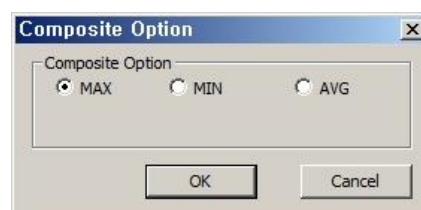
③ Go to "Run" and execute "Run Combine Time-Series".
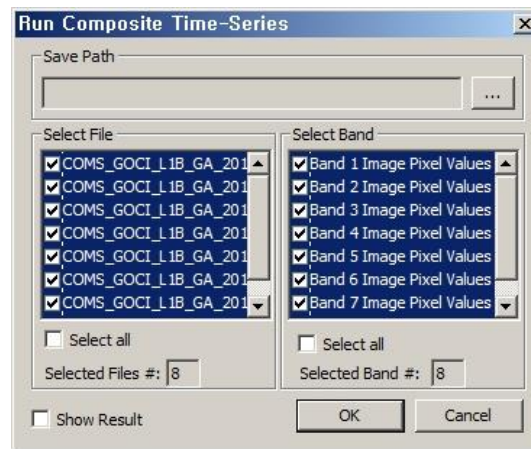
- Save Path: allows you to select a file name and the storage path.

- Select File: allows you to select a file for time-series synthesis.

- Select Band: allows you to select a band for time-series synthesis.

- Show Result: Upon checking it, the image appears on the "Image Display Area" upon completion of time-series synthesis.

➢ Create Animation

① Go to "File", and execute "Add" to add an input file.
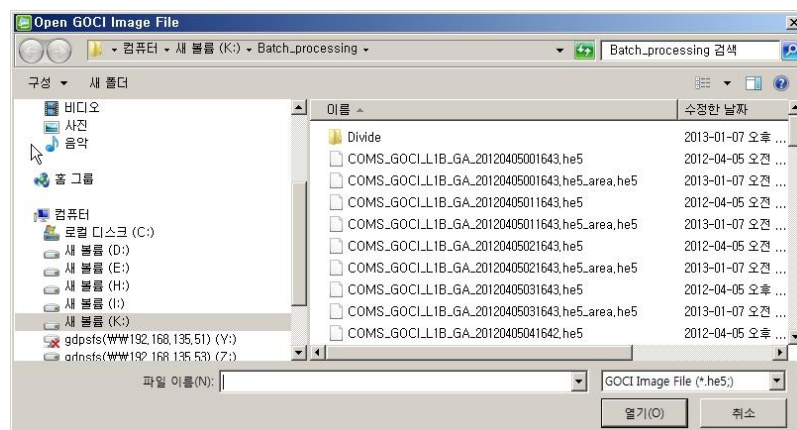
② Go to "Run", and execute "Make Animation Frames".
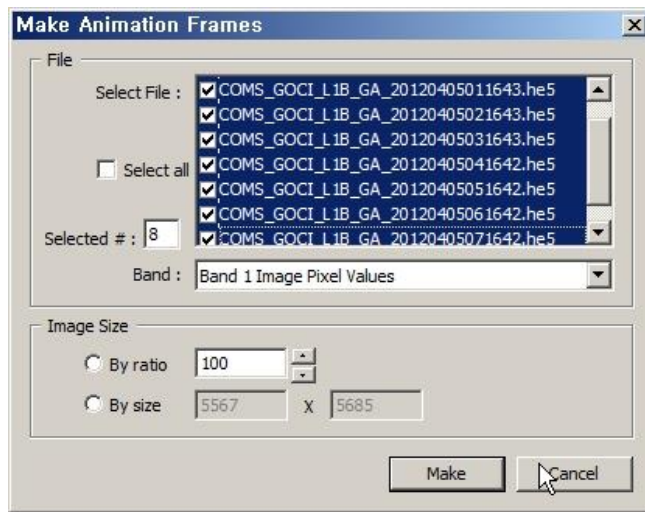
- Select File: selects a file.

- Band: selects a specific band.

- Image Size: designates the size of an image when it is shown on the "Image Display Area" upon completion of creating the animation "Image Display Area"

- Designate the size of the image as it appears on the Display Area.

③ View the animated image.

◈ If the animation content is available, it is enabled as described below.
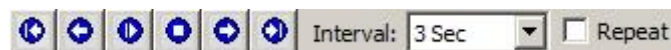
- : shows the first frame image.

- : shows the previous frame image.

- : runs the animation.

- : stops the animation.

- : shows the next frame image.

- : shows the last frame image.

- Interval: allows you to set the interval of exposure between frames.

- Repeat: allows you to determine whether or not to repeat running the animation.

2.5   Option

"Option" includes a variety of configuration functions in addition to major settings, including "Color Scale", "Color Scale 3-Band", "Graticule Setting", "Processing Parameter Setting", and "Data Path Setting".
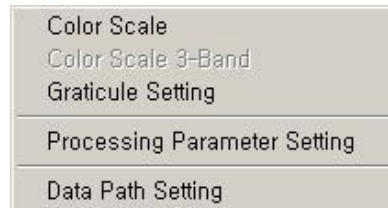
1)   Color Scale

It includes the function that controls the "color table", "min", "max", and "color bar" size of the image that appears on the "Image Display Area" and the functions as to showing the image..

◈ You can use the "Color Scale" function by selecting .
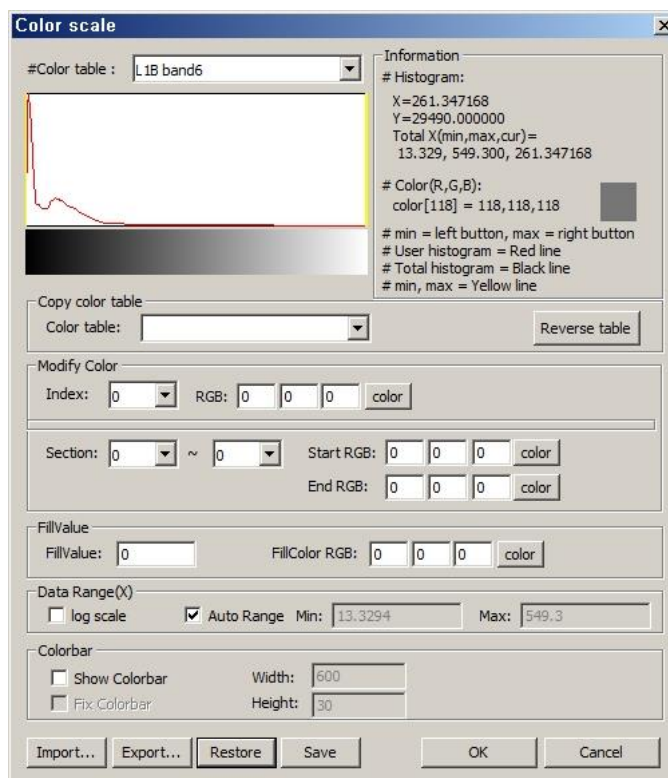
- Color Table: shows the "Color Table" name of the band enabled in the "Image Display Area".

◆ Each band has its default "Color Table", and a user may also select one.

- Histogram and Color Scale Viewer: shows the band histogram and "Color Scale" enabled in the "Image Display Area".

◆ You may select the minimum or the maximum value of the image that appears on the window by unchecking "Auto Range" in the "Data Range" and right-clicking the mouse (maximum) or left-clicking the mouse (minimum), respectively in the histogram window.

◆ "Color Scale" accepts the value set in the "Copy color table" or "Modify Color".

- Information: shows the information pointed by the mouse when it is located either in the Histogram Window or "Color scale".

- Copy color table: replaces the current "Color Table" with the one kept in GDPS.

- [Reverse table]: reverses the current "Color table".

- Modify Color: modifies the existing "Color table". There are two methods of doing that as described below.

  A. Index: modifies the "Color table" values on an individual basis.

  B. Section: modifies the "Color table" values on a sectional (range) basis starting from a specific color.

◆ "Color table" is represented by 256 colors with the range between 0 and 255.

  A. Fill Value: allows you to designate a specific color to a "Fill Value" value with the default value being black.

  B. Data Range: allows you to set minimum or maximum for the image shown on the "Image Display Area" or to convert the histogram to the "Log scale".

◆ In the case of using the "Log scale", the minimum value must be a real number greater than 0.

◆ You may select the minimum or the maximum value of the image that appears on the window by unchecking "Auto Range" in the "Data Range" and right-clicking the mouse (maximum) or left-clicking the mouse (minimum), respectively in the histogram window.

- Color bar: resizes the "Color bar" where "Color table" is shown and shows the "color bar" in the "Image Display Area".

◈ "Color bar" appears on top of the image. Since the "Color bar" is invisible when moving the image after enlarging it, you should conduct "Fix Colorbar" to fix the "color bar" on top of the "Image Display Area".

- Import: imports the existing "Color table" information.

- Export: exports and saves the modified "Color table" into a file.

- Restore: restores the value back to its original value.

- Save: saves the modified "Color table" into GDPS.

2) Color Scale 3-Band

This is enabled when the image synthesized through "Analysis"->"Composite 3-band" is shown on the "Image Display Area" with the scaled-down function of "Color Scale" included.
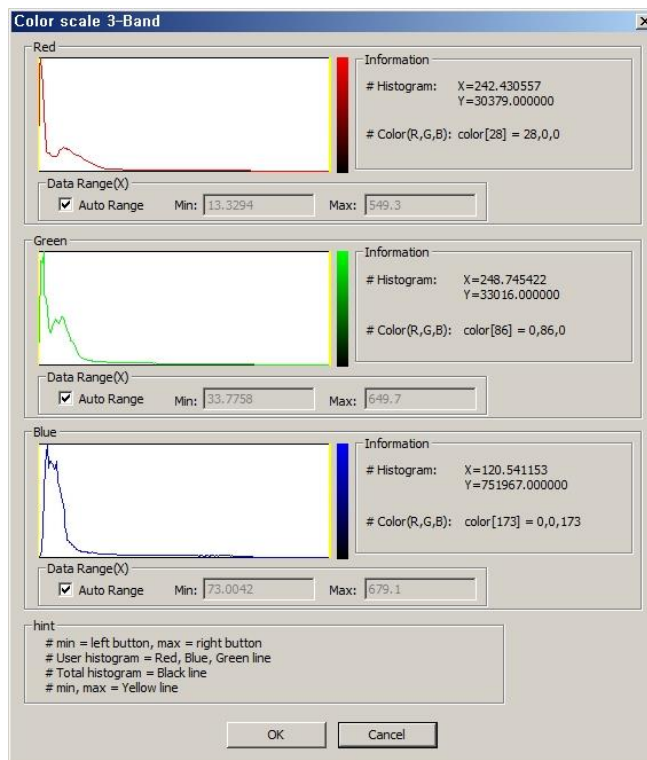
- Data Range: allows you to set the minimum and the maximum of the data by band shown on the "Image Display Area".

- Hint: described the method of viewing and interpreting the histogram.

3) Graticule Setting

You can modify the detailed information on latitude & longitude by going to "View" and selecting "Show Graticule".
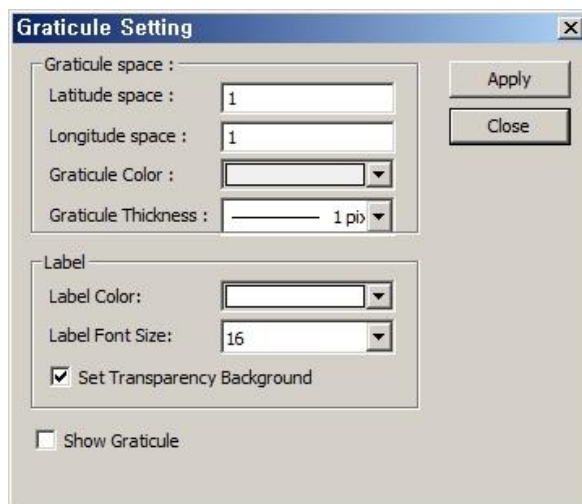
- Graticule Space

    A. Latitude space: the space of the line that indicates the latitude shown on the window (unit: degree)

    B. Longitude space: the space of the line that indicates the longitude shown on the window (unit: degree)

    C. Graticule Color: the color of the line that indicates the latitude & longitude shown on the window

    D. Graticule Thickness: the thickness of the line that indicates the latitude & longitude shown on the window

- Label

A. Label Color: the color of the characters that represent the value of latitude & longitude.

B. Label Font Size: the size of the characters that represent the value of latitude & longitude.

C. Set Transparency Background: background of the "Label". It is set to be white by default and, upon clicking it, it turns into transparent one.

- Show Graticule: shows the set latitude & longitude on the "Image Display Area" and is the same as "View"->"Show Graticule".
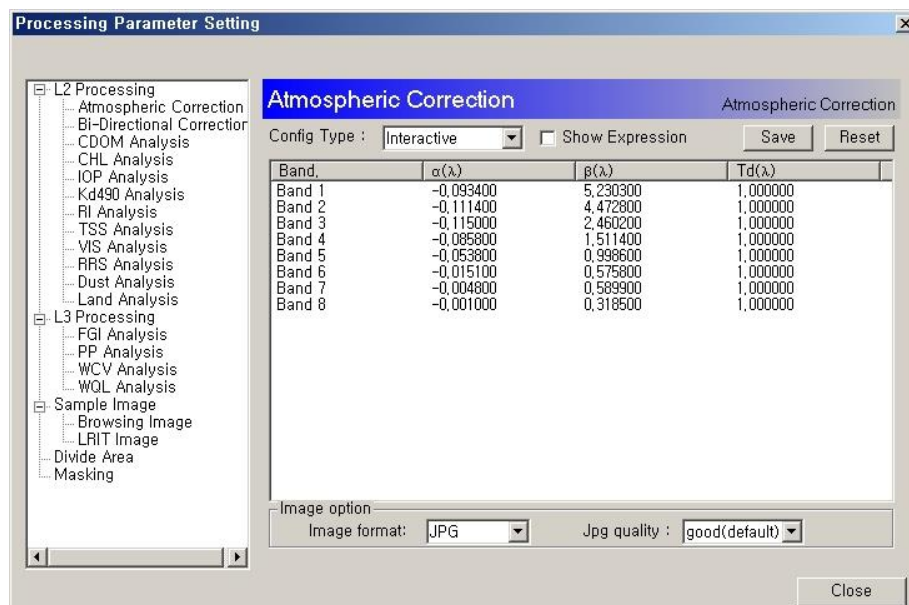
4) Processing Parameter Setting

It allows you to manage coefficient values of each output algorithm in processing images, including L2 and L3.
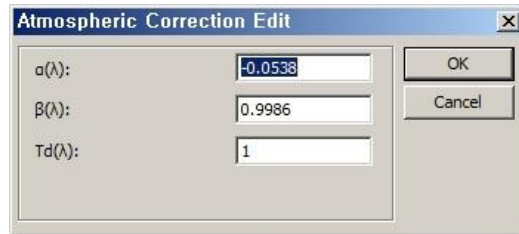
➢ L2 Processing Items

- Atmospheric Correction

It manages coefficient values of SSMM algorithm for atmospheric correction (Atmospheric Correction)

A. Modify coefficient value: Double-clicking each band will cause the following popup to appear. Modify the coefficient value, click [OK] and click [Save] on the "Atmospheric Correction" window to apply the change.
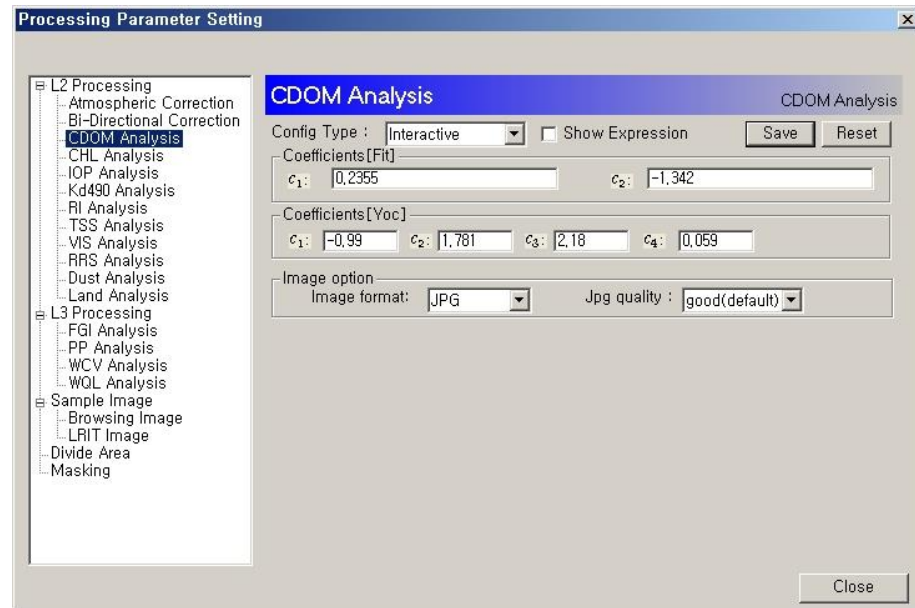

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of "SSMM".

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- Bi-Directional Correction

It manages Bi-Directional correction coefficient value used to convert Lw into nLw.
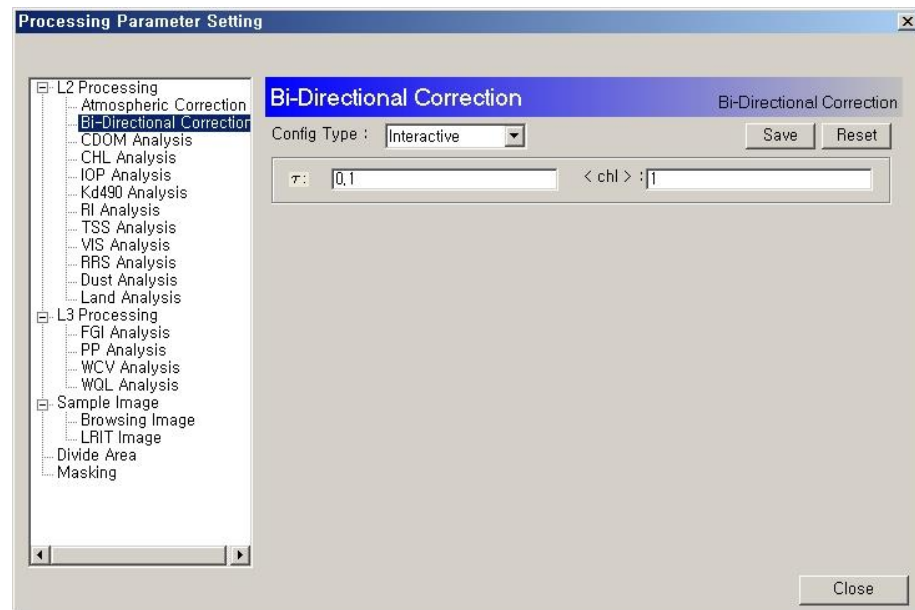
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Save: saves the modified coefficient value.

D. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

- CDOM Analysis

It allows you to manage coefficient values of the algorithm for CDOM.

A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: Shows the algorithm formula for CDOM.

■ Moon(2010)

$$a_{dom}(412) = c_1 \times \left(\frac{R_{rs}(412)}{R_{rs}(555)}\right)^{c_2}$$

$$c_1 = 0.2047 \ C_2 = -1.3351$$

Bibliography: Mun Jeong-Eon, Ahn Yu-Hwan, Yu Ju-Hyeong, P.Shanmugam.(2010)
Development of Ocean Environmental Algorithms for Geostationary Ocean Color Imager (GOCI). Korean Journal of Remote Sensing, 26(2):189-207

■ YOC

$$CDOM_{yoc} = 10^{(c1 - c2 \times \log_{10}(R) - c3 \times (log_{10}R)^2)}$$

$$R = \left(\frac{R_{rs}(490)}{R_{rs}(555)}\right)\left(R_{rs}(443)\right)^{c4}$$

$$c_1 = -.099 \ c_2 = 1.781 \ c_3 = 2.18 \ c_4 = 0.059$$

Bibliography: E. Siswanto, J. Tang, H. Yamaguchi, Y.-H. Ahn, S. Yoo, J. Ishizaka, S.-W. Kim, Y. Kiyomoto, K. Yamada, C. Chiang, H. Kawamura (2011) Empirical ocean-color algorithms to import chlorophyll-a, total suspended matter, and colored dissolved organic matter absorption coefficient in the Yellow and East China Seas. Journal of Oceanography 67(5):627-650

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- CHL Analysis

It manages coefficient values used in the chlorophyll concentration algorithm.
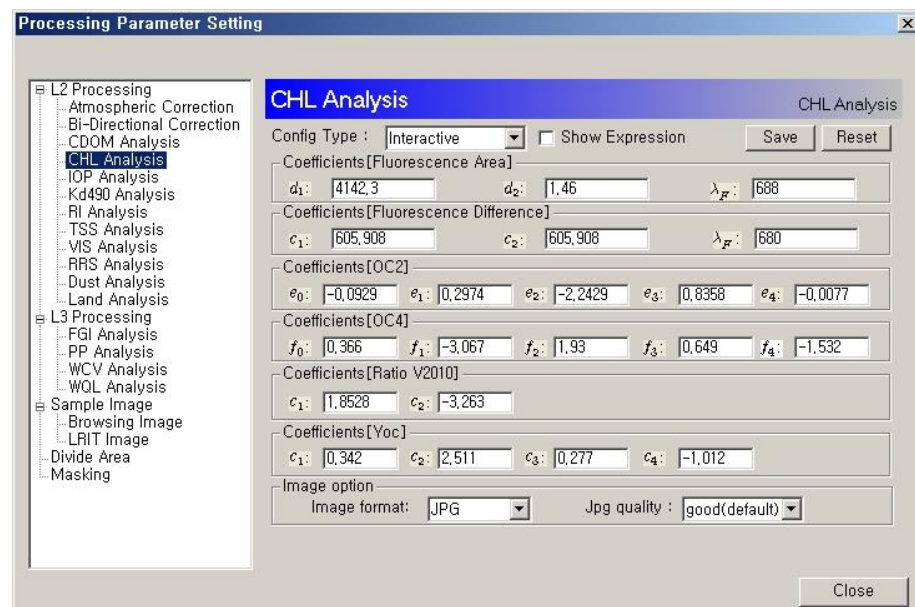
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula for CHL.

■ Fluorescence Area

$$CHL_{area} = d_1 \times \left| \Delta Flu_{(area)} \right|^{d_2}$$

$$\Delta Flu_{(area)} = \int_{660}^{730} \Delta Flu(\lambda) d\lambda$$

$$d_1 = 4142.3 \ d_2 = 1.46 \ \lambda_F = 688$$

Bibliography: Ahn, Y. H. and P. Shanmugam, 2007. Derivation and analysis of the fluorescence algorithms to estimate phytoplankton pigment concentreations in optically complex coastal waters. Journal of Optics A: Pure and Applied Optics, 9(4): 352–362.

■ Fluorescence Difference

$$CHL_{diff} = c_1 \times \left| \Delta Flu(\lambda_f) \right|^{c_2}$$

$$\Delta Flu(\lambda_f) = R_F - \left[\left(\frac{R_L - R_S}{\lambda_L - \lambda_S} \right) (\lambda_F - \lambda_S) + R_S \right]$$

$$c_1 = 605908 \ c_2 = 1.48 \ \lambda_F = 680$$

Bibliography: Ahn, Y. H. and P. Shanmugam, 2007. Derivation and analysis of the fluorescence algorithms to estimate phytoplankton pigment concentreations in optically complex coastal waters. Journal of Optics A: Pure and Applied Optics, 9(4): 352–362.

■ OC2

$$CHL_{oc2} = e_0 + 10^{e_1 + e_2 \times R + e_3 \times R^2 + e_4 \times R^3}$$

$$R = \log_{10} \left(\frac{R_{rs}(490)}{R_{rs}(555)} \right)$$

$$e_0 = -0.0929 \ e_1 = 0.2974 \ e_2 = -2.2429 \ e_3 = 0.8358 \ e_4 = -0.0077$$

Bibliography: O'Reilly, J. E., S. Maritorena, B. G. Mitchell, D. A. Siegel, K. L. Carder, S. A. Garver, M. Kahru, and C. McClain, 1998. Ocean color chlorophyll algorithm for SeaWiFS. Journal of Geophysical Research, 103(C11): 24937–24953.

■ OC3G

$$CHL_{oc3G} = 10^{f_1 + f_2 \times R + f_3 \times R^2 + f_4 \times R^3}$$

$$R = \left(\frac{R_{rs}(443) > R_{rs}(490)}{R_{rs}(555)}\right) \text{ Modify R to fit GOCI.}$$

$$f_0 = 0.366 \; f_1 = -3.067 \; f_2 = 1.93 \; f_3 = 0.649 \; f_4 = -1.532$$

Bibliography: O'Reilly, J. E., S. Maritorena, B. G. Mitchell, D. A. Siegel, K. L. Carder, S. A. Garver, M. Kahru, and C. McClain, 1998. Ocean color chlorophyll algorithm for SeaWiFS. Journal of Geophysical Research, 103(C11): 24937–24953.

■ Ratio V2010

$$CHL_{ratio} = c_1 \times R^{c2}$$

$$R = \frac{\left(R_{rs}(443) + R_{rs}(490)\right) - R_{rs}(412)}{R_{rs}(555)}$$

$$c_1 = 1.8528 \; c_2 = -3.263$$

Bibliography: Mun Jeong-Eon, Ahn Yu-Hwan, Yu Ju-Hyeong, P.Shanmugam. (2010) Development of Ocean Environmental Algorithms for Geostationary Ocean Color Imager (GOCI). Korean Journal of Remote Sensing, 26(2):189–207

■ YOC

$$CHL_{yoc} = 10^{\left(c1 - c2 \times \log_{10}(R) - c3 \times Log_{10}^2(R)\right)}$$

$$R = \left(\frac{R_{rs}(443)}{R_{rs}(555)}\right)\left(\frac{R_{rs}(412)}{R_{rs}(490)}\right)^{c4}$$

$$c_1 = 0.342 \; c_2 = 2.511 \; c_3 = 0.277 \; c_4 = -1.012$$

Bibliography: E. Siswanto, J. Tang, H. Yamaguchi, Y.-H. Ahn, S. Yoo, J. Ishizaka, S.-W. Kim, Y. Kiyomoto, K. Yamada, C. Chiang, H. Kawamura (2011) Empirical ocean-color algorithms to import chlorophyll-a, total suspended matter, and colored dissolved organic matter absorption coefficient in the Yellow and East China Seas. Journal of Oceanography 67(5):627–650

D. Save: saves the modified coefficient value and the "image option".

E. Reset: reset coefficient value back to the original value embedded in GDPS.

F. Image option: allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- Kd490 Analysis

It manages the coefficient values for Kd490 algorithm.
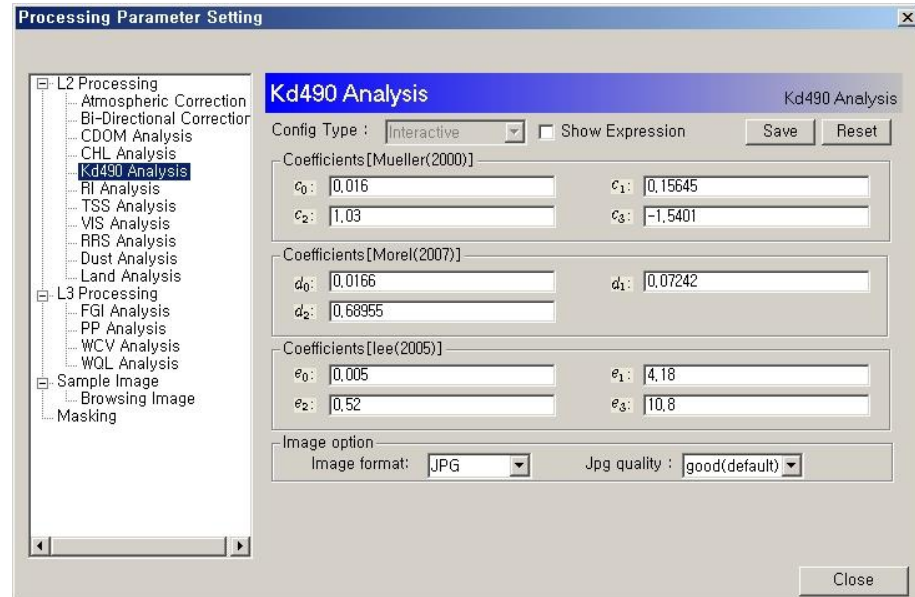
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: Shows the coefficient values for Kd490 algorithm.

■ Muller(2000)

$$K_d(490) = c_0 + c_1 \times \left(c_2 \times \frac{R_{rs}(490)}{R_{rs}(550)} \right)^{c_3}$$

$$c_0 = 0.016 \; c_1 = 0.15645 \; c_2 = 1.03 \; c_3 = -1.5401$$

Bibliography: Mueller, J. L. (2000), SeaWiFS algorithm for the diffuse attenuation coefficient, K(490), using water-leaving radiances at 490 and 555 nm, in Sea-WiFS Postlaunch Calibration and Validation Analyses, part 3, edited by S. B. Hooker, pp. 24 – 27, NASA Goddard Space Flight Cent., Greenbelt,Md.

■ Morel(2007)

$$K_d(490) = d_0 + d_1 \times CHL^{d_2}$$

$$d_0 = 0.0166 \; d_1 = 0.07242 \; d_2 = 0.68955$$

Bibliography: Morel, A., Y. Huot, B. Gentili, P.J. Werdell, S.B. Hooker, B. A. Franz (2007). Examining the consistency of products derived from various ocean color sensors in open ocean (Case 1) waters in the perspective of a multi-sensor approach, Remote Sensing of Environment 111:69-88

■ Lee(2005)

$$K_d = (490) = (1 + e_0 \times \theta_s) \times a(490) + e_1 \times \left[1 - e_2 \times exp\left(-e_3 \times a(490)\right)\right] \times b_B(490)$$

$$e_0 = 0.005 \; e_1 = 4.18 \; e_2 = 0.52 \; e_3 = 10.8$$

Bibliography: Lee, Z.P., M. Darecki, K.L. Carder, C.O.Davis D. Stramski, W.J. Rhea, (2005),Diffuse Attenuation coefficient of downwelling irradiance: An evalution of remote sensing methods, Journal of Geophysical Research, 110(C2)

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- RI Analysis

It manages the coefficient value of the algorithm designed to obtain the red tide data from the water leaving radiance.
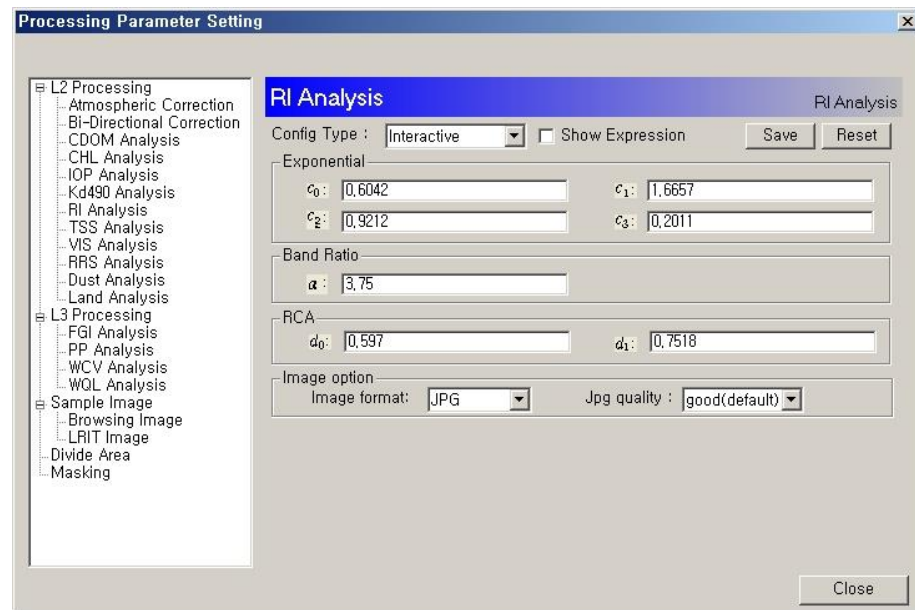
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of RI.

■ Exponential

$$\text{Exponential RI} = 10^{\left(c_0 + c_1 \times L_w(443) + c_2 \times L_w(443)^2 + c_3 \times L_w(443)^3\right)}$$

$$c_0 = 0.919 \; c_1 = -1.3936 \; c_2 = 0.6259 \; c_3 = -0.1069$$

Bibliography: Ahn, Y. H. and P. Shanmugam, 2006. Detecting the red tide algal blooms from satellite ocean color observations in optically complex Northeast-Asia Coastal waters. Remote Sensing of Environment, 103(4): 419-437.

■ Band Ratio

$$\text{Band Ratio RI} = \frac{(Lw(490) \times 0.1)/((Lw(555) \times 0.1) - a \times (Lw(443) \times 0.1))}{(Lw(490) \times 0.1)/((Lw(555) \times 0.1) + a \times (Lw(443) \times 0.1))}$$

$$a = 1$$

Bibliography: Ahn, Y. H. and P. Shanmugam, 2006. Detecting the red tide algal blooms from satellite ocean color observations in optically complex Northeast-Asia Coastal waters. Remote Sensing of Environment, 103(4): 419-437.

■ RCA

$$\text{RCA} = d_0 \times exp^{(d_1 \times \text{Exponential RI})}$$

$$d_0 = 0.316 \; d_1 = 0.61$$

Bibliography: Ahn, Y. H. and P. Shanmugam, 2006. Detecting the red tide algal blooms from satellite ocean color observations in optically complex Northeast-Asia Coastal waters. Remote Sensing of Environment, 103(4): 419-437.

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- TSS Analysis

It manages the coefficient value of the algorithm for total suspended matters.
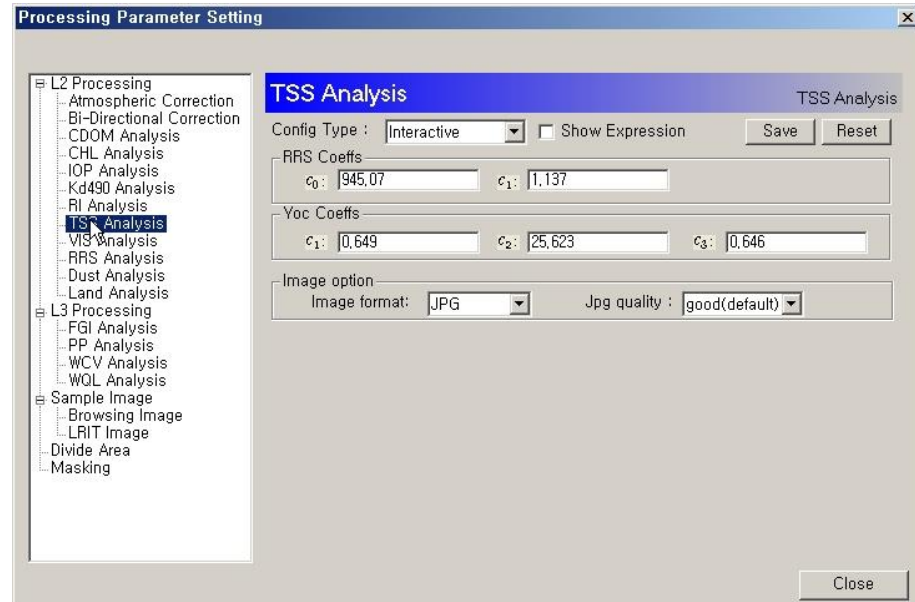
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of TSS.

■ KOSC Standard

$$TSS = c_0 \times R_{rs}(555)^{c_1}$$

$$c_0 = 945.07 \ c_1 = 1.137$$

Bibliography: Mun Jeong-Eon, Ahn Yu-Hwan, Yu Ju-Hyeong, P.Shanmugam.(2010)
Development of Ocean Environmental Algorithms for Geostationary Ocean Color Imager (GOCI).
Korean Journal of Remote Sensing, 26(2):189-207

■ YOC

$$TSS_{yoc} = 10^{\left(c_1 + c_2\left(R_{rs}(555) + R_{rs}(670)\right) - c_3\left(\frac{R_{rs}(490)}{R_{rs}(555)}\right)\right)}$$

$$c_1 = 0.649 \ c_2 = 25.623 \ c_3 = 0.646$$

Bibliography: E. Siswanto, J. Tang, H. Yamaguchi, Y.-H. Ahn, S. Yoo, J. Ishizaka, S.-W. Kim, Y. Kiyomoto, K. Yamada, C. Chiang, H. Kawamura (2011) Empirical ocean-color algorithms to import chlorophyll-a, total suspended matter, and colored dissolved organic matter absorption coefficient in the Yellow and East China Seas. Journal of Oceanography 67(5):627-650
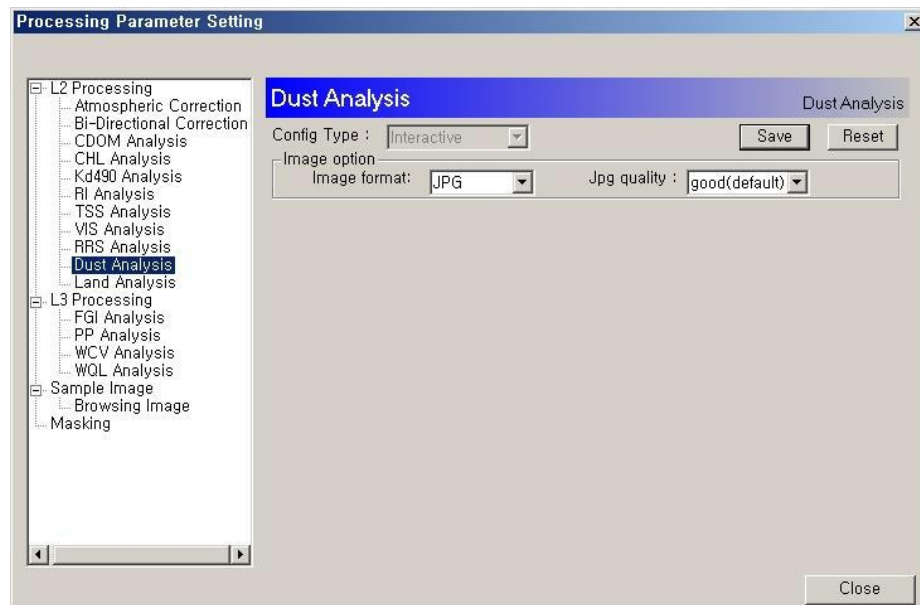
D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- VIS Analysis

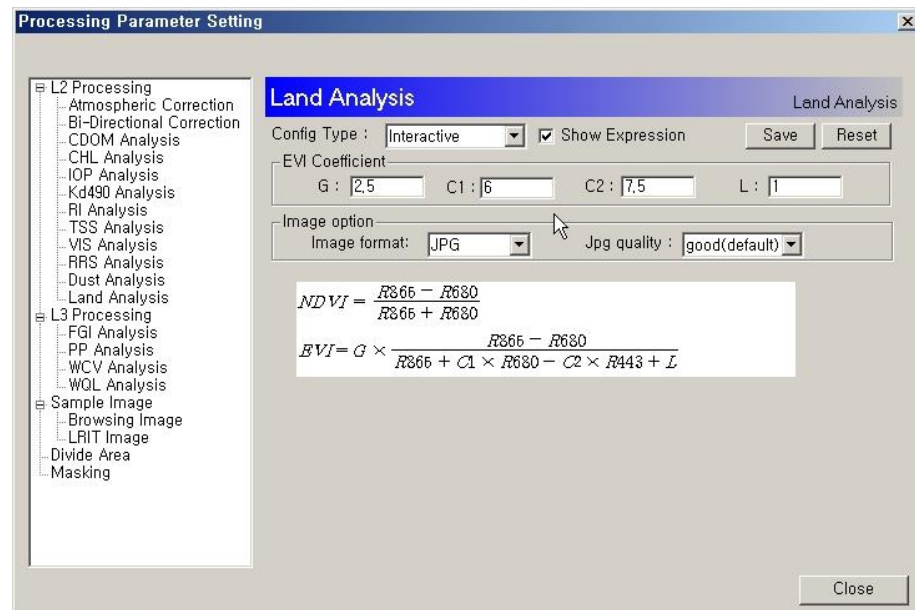It manages the coefficient value of the algorithm to analyze the underwater horizontal visibility range.
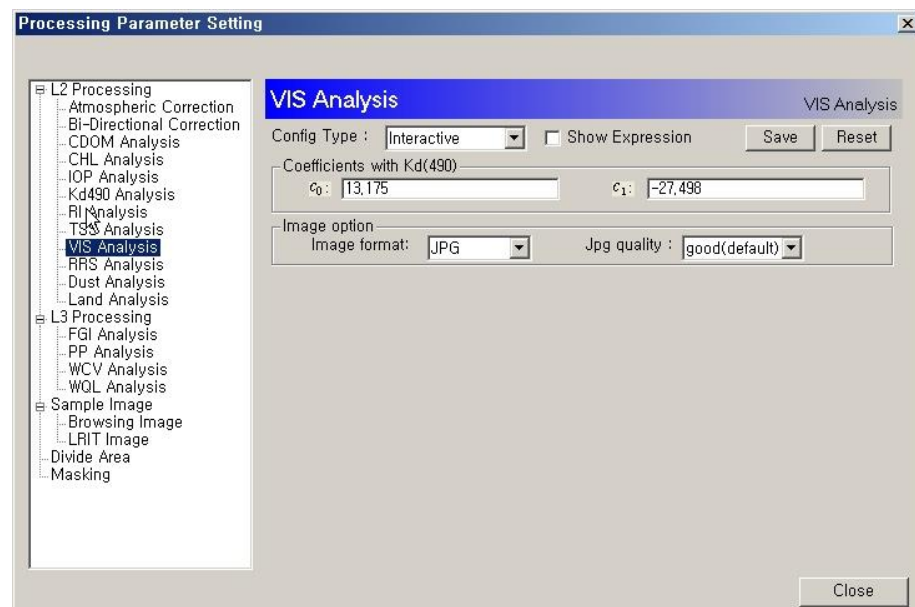
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of VIS.

$$\text{VIS} = c_0 + c_1 \times Kd(490)$$

$$c_0 = 13.175 \; c_1 = -27.498$$

Bibliography: Min Ji-Eun, Yu Ju-Hyeong, Ahn Yu-Hwan, Lee Gyu-Seong, 2007. Diffuse attenuation coefficient for down-welling irradiance (Kd(λ)), Underwater visibility, Yellow Sea, Case-2 water, Korean Journal of Remote Sensing, 23(4): 311-321

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

-   RRS Analysis

It manages the coefficient value of the algorithm to analyze the remote sensing reflectance .
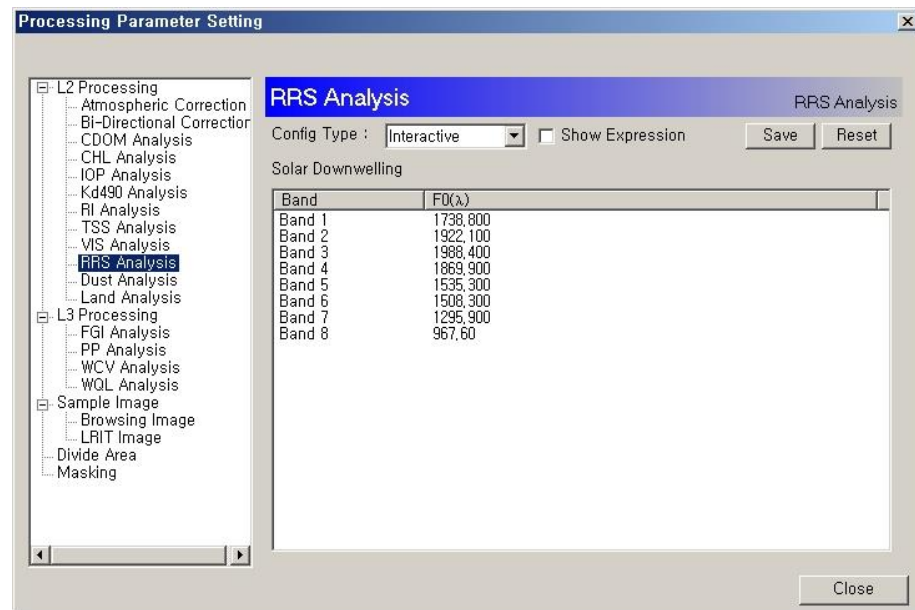
A. Modify coefficient value: Double-clicking each band will cause the following popup to appear. Modify the coefficient value, click [OK] and click [Save] on the F0(λ) window to apply the change.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of RRS

$$R_{rs}(\lambda) = \frac{nLw(\lambda)}{F_0(\lambda)}$$

D. Save: saves the modified coefficient values and "image option".

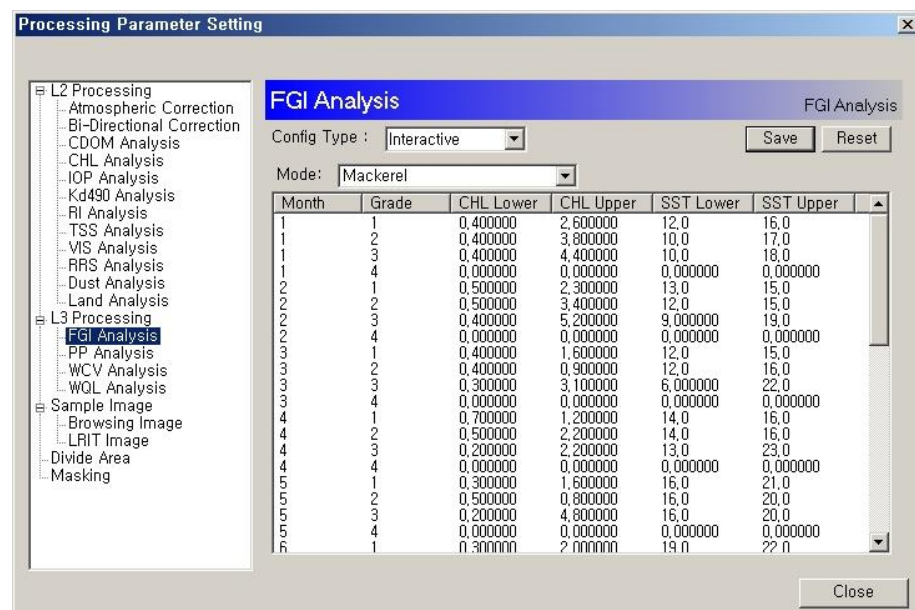E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- Dust Analysis

- It manages the coefficient value of the algorithm to analyze the yellow dust.

Bibliography: Lee J, Kim J, Song C H, Ryu J H, Ahn Y H, Song C K, (2010) Algorithm for retrieval of aerosol optical properties over the ocean from the Geostationary Ocean Color Imager, Remote Sensing of Environment 114:1077-1088

A. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

B. Save: saves the modified coefficient values and "image option".

C. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

D. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- Land Analysis

It manages the coefficient value of the algorithm to analyze the vegetation index.

A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of NDVI and EVI.

$$NDVI = \frac{R_{680} - R_{865}}{R_{680} + R_{865}}$$

$$EVI = \frac{G \times R_{865-}R_{680}}{R_{865+}C_1 \times R_{680} - C_2 \times R_{443} + L}$$

$$G = 2.5 \; C1 = 6 \; C2 = 7.5 \; L = 1$$

Bibliography: Huete AR, Justice C (1999) MODIS vegetation index (MOD13) algorithm theoretical basis document Ver 3. USGS Land Process Distributed Active Archive Center. http://modis.gsfc. nasa.gov/data/atbd/atbd_mod13.pdf

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F.   Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

➢   L3 Processing Items

-   FGI Analysis

It manages the coefficient value of the algorithm to analyze the fishing ground information.

Bibliography: Korea Institute of Ocean Science & Technology(2007), COMS ocean data processing systems development project (Ⅳ)

A.   Modify coefficient value: Double-clicking the list will cause the following popup to appear. Modify the coefficient value, click [OK] and click [Save] on the FGI window to apply the change.

B.   Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C.   Save: saves the modified coefficient values and "image option".

D. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

E. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.
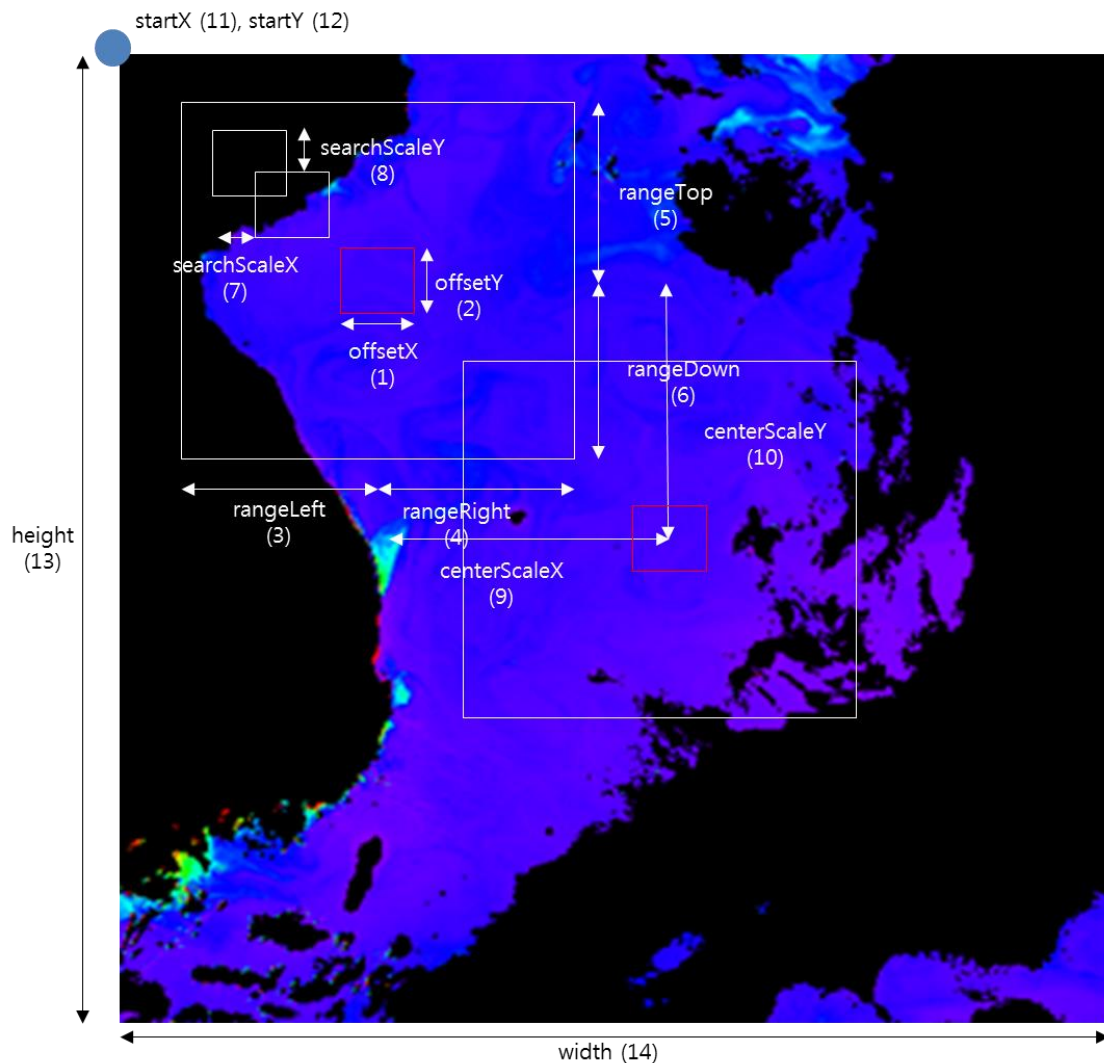
- PP Analysis

It manages the coefficient value of the algorithm to produce the primary productivity data based on the signal from seawater.
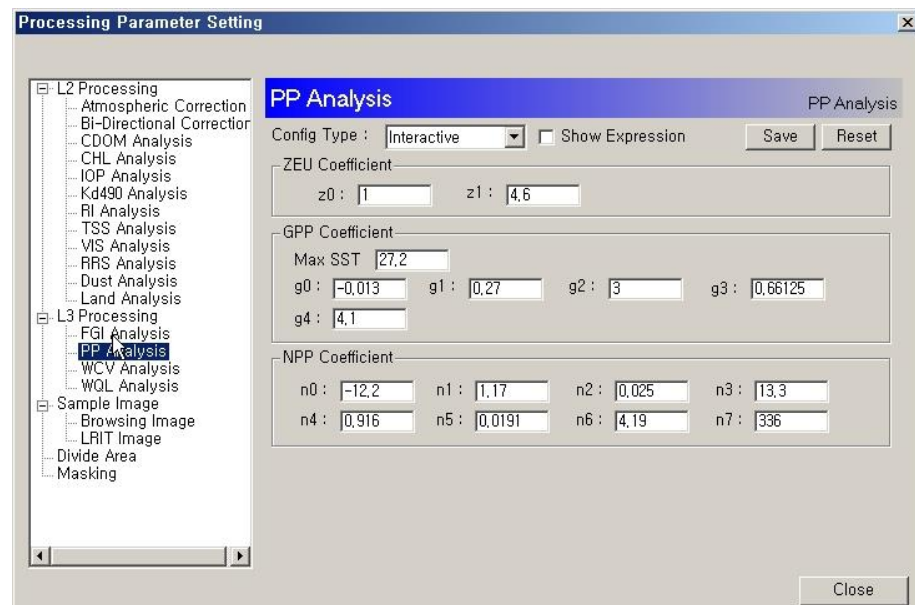
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the algorithm formula of PP

■ YSVGPM Gross Primary Production (GPP) calculations (YSVGPM)

$$GPP = g_3 \times GPB_{opt} \times \frac{PAR}{(PAR + g_4)} \times Zeu \times SCHL \times DL$$

$$GPB_{opt} = g_0 \times SST^2 + g_1 \times SST + g_2 \ (SST < 27.2°C)$$

$$g_0 = -0.013 \quad g_1 = 0.27 \quad g_2 = 3 \quad g_3 = 0.66125 \quad g_4 = 4.1$$

$$\text{Zeu} = \frac{z_0}{K_d(490)} \times z_1$$

$$z_0 = 1 \quad z_1 = 4.6$$

Bibliography: Yoo S, Ahn YH, Park JS (2008) A depth-resolved primary production model for stratified water in the Yellow Sea. Proc SPIE 7150:71500Z

■   KI Net Primary Production (NPP) calculations (KI)

$$\text{NPP} = n_7 \times GPB_{opt} \times \frac{PAR}{(PAR + n_8)} \times Zeu \times SCHL \times DL$$

$$NPB_{opt} = \frac{(n_0 \times SST - n_1 \times 10^{-3} \times SST^2 + n_2 \times 10^{-5} \times SST^3)}{SCHL} + (n_3 + n_4 \times SST - n_5 \times 10^{-3} \times SST^2 - n_6 \times 10^{-5} \times SST^3)$$

$$n_0 = 0.017 \quad n_1 = 3.2 \quad n_2 = 3 \quad n_3 = 1.0 \quad n_4 = 0.17 \quad n_5 = 2.5 \quad n_6 = 8 \quad n_7 = 0.66125 \quad n_8 = 4.1$$

$$\text{Zeu} = \frac{z_0}{K_d(490)} \times z_1$$

$$z_0 = 1 \quad z_1 = 4.6$$

Bibliography: Kameda T, Ishizaka J (2005) Size-fractionated primary production estimated by a two-phytoplankton community model applicable to ocean color remote sensing. J Oceanogr 61:663-672

D.   Save: saves the modified coefficient values and "image option".

E.   Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F.   Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- WCV Analysis

It manages the coefficient value of the algorithm to analyze the extraction of the water current vector.


A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Save: saves the modified coefficient values and "image option".

D. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

E. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

- Time Gap: time gap between the Before image and the After image (hour)

- Max Velocity: the value of maximum velocity (m/s) or higher is regarded as an error.

- Min Velocity: the value of minimum (m/s) or lower is regarded as an error.

- Correlation Threshold: the similarity of two images must be greater than this value to be valid.

- Offset X, Y: the value (pixel) of the width and height of the area set to compare the similarity

- Range Left, Right, Top, Down: the range (pixel) of top, down, left and right compared to find the similar area

- Search Scale X, Y: the range (pixel) that is skipped in every level in the process of comparing the similarity.

- Center Scale X, Y: the range (pixel) that is skipped to select the next area after searching the similarity in a each area

- Target StartX, StartY, Width, and Height: the range (pixel) set to obtain the ocean current vector. The entire image is set by default but you may select any area of your choice by checking the checkbox.

- L2A File Index: Allows you to designate two files. This function is used in the Realtime.

  * L2A File Index means an observation time index. "0" and "1" mean the image files observed at 00:15 and 01:15 (UTC).

- WQL Analysis

  It manages the coefficient value of the algorithm to analyze the water quality level.
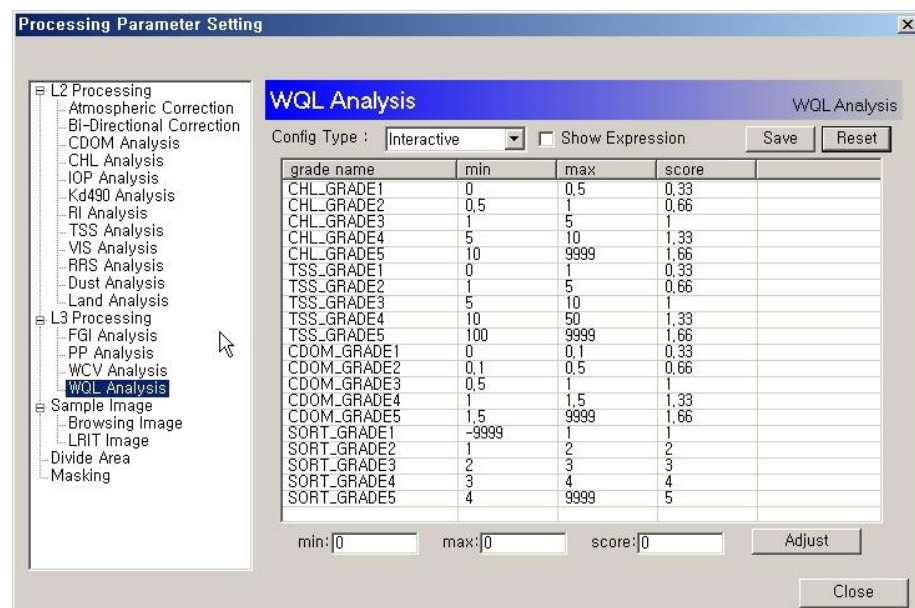
A. Modify coefficient value: allows you to modify the coefficient value. Click [Save] upon completion of modifying them.

B. Config Type: There are two paths for saving coefficient values: Interactive and Realtime. A regular user should modify the coefficient value in Interactive to have it incorporated into processing L2 and L3.

C. Show Expression: shows the grade of WQL.

D. Save: saves the modified coefficient values and "image option".

E. Reset: Resets the coefficient values back to the ones originally embedded in GDPS.

F. Image option: Allows you to produce an image file corresponding to each output produced in L2 processing and to control the quality of image in such formats as JPG and BMP.

➢ Sample Image Items

- Browsing Image

A browsing image created at the time of L2 processing.
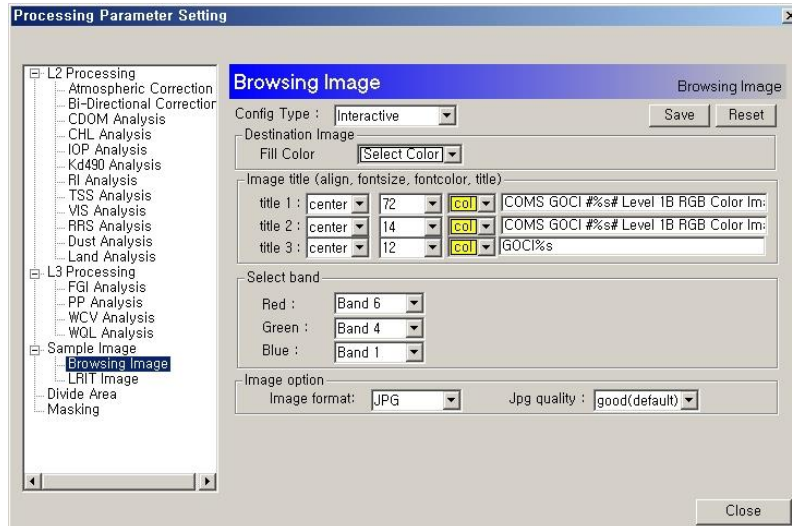
A. Destination Image: the background color of a browsing image.

B. Image title: the position, size and the name of a title shown on top in creating a browsing image.

C. Select band: the band of the wavelength used in creating a browsing image.

D. Image Option: the format of an image that can be created.

5) Data Path Setting

It shows the path where auxiliary data and "Processing Parameter" are kept. The default path is set upon installation of the program but you may change the path later on.
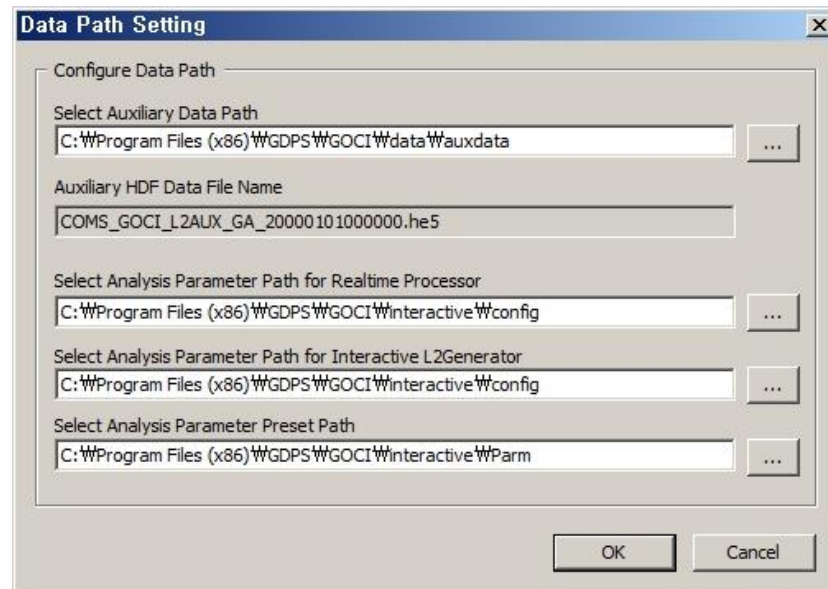
2.6   Window

It includes a variety of window management functions, including arrangement and closing of the windows enabled in the "Image Display Area".

1) Cascade

It arranges windows in a cascade.

2) Tile Horizontally

It arranges windows horizontally.

3) Tile Vertically

It arranges windows vertically.

4) Tile Window

It positions enabled window on the left and the rest on the right.

5) Close

It closes the currently selected window.

6) Close All

It closes all windows.

2.7　Help

1) Contents

It shows Help for GDPS.

2) About GDPS

It shows the version information for GDPS.

3　Tool Bar

It contains the most frequently used functions in viewing images in the "Image Display Area".

- : Opens file.

- : Closes the file selected in the "Data Set Tree View".

- : Closes all files in the "Data Set Tree View".

- : Closes the window selected in the "Image Display Area".

- : Closes all windows in the "Image Display Area".

- : Print

- : Select

- : Moves the image (Pan)

- : Adds a circular object to the current window.

- : Adds a rectangular object to the current window.

- : Adds a line object to the current window.

- : Adds a polygon object to the current window.

- : Adds a text object to the current window.

- : Adds a point object to the current window.

- : Measures the distance.

- : Executes "ROI & Annotation Manager".

- : Executes "Color Scale".

- : Executes "Color Scale 3-Band".

- : Enlarges an image.

- : Reduces an image.

- : Resizes an image size to fit the current window.

- : Restores an image to its original size.

- : Arranges the currently open image windows in a cascade.

- : Arranges the currently open image windows vertically.

- : Arranges the currently open image windows horizontally.

- : shows the information on the currently selected file.

- : shows the version of GDPS.

- : shows the GDPS Help

- : Executes "Generate L2/L3 Data".

- : Executes "HDF-EOS5 Data Generator"

- : Executes "Divide Area"

- : Executes "Combine Area"

- : Executes "Combine Time-series/Animation Tool for GDPS"

- : Executes "Batch Processing"

4   Data Set Tree View Pop-up

Importing a GOCI image will cause the list to appear. Double-clicking a band will cause the associated image to appear on the "Image Display Area". Select the file name of an image or band and right-click the mouse, and you will see a variety of useful functions.

1) Fold All

    It folds all files.

2) Unfold All

    It unfolds all files.

3) File Information

    It shows the information on the selected file.

4) Convert to ASCII

It converts the selected file into its equivalent ASCII file.

5) Convert to Image

It converts the selected file into its equivalent image format.

6) Convert to Binary

It converts the selected file into its equivalent binary format.

7) Export to Other Format

It converts the selected file into its equivalent ENVI format.

8) Scatter Diagram

It executes "Scatter Diagram" of the selected file.

9) Bandmath

It executes "Bandmath" of the selected file.

10) Tool

- Generate L2/L3 Data: executes "Generate L2/L3 Data" of the selected file.

- HDF-EOS5 Data Generator: executes "HDF-EOS5 Data Generator" of the selected file.

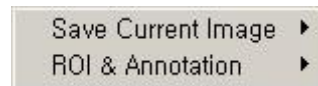- Divide Area: executes "Divide Area" of the selected file.

11) Close

It closes the selected file.

12) Close All File

It closes all files shown in the "Data Set Tree View".

5   Image Display Area Pop-up

It is the area where GOCI images are shown and contains the function that saves an image as it is shown by right-clicking the mouse and the function that modifies and deletes AOI.

1) Save Current Image

It saves an image shown in the "Image Display Area" as it is. You can select it depending on the compression ratio of an image.

2) ROI & Annotation

It is enabled when an object is shown in the "Image Display Area".

-    Manager: executes "ROI & Annotation Manager".

-    Property: the property window of the selected object.

-    Remove: removes the selected object.

-    Remove All: removes all objects shown in the "Image Display Area".